THE MILBANK MEMORIAL FUND

QUARTERLY BULLETIN

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CONTENTS

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IMPROVED TECHNIQUE IN THE SURGICAL TREATMENT OF FACIAL PALSY

The Ballance-Duel Method of Direct Repair of the Injured Nerve by an Autoplastic Graft

by ARTHUR B. DUEL, M.D.

IF I were asked to name one human feature which more than any other seemed to me to reveal the character of an individual, I am sure that I should say "facial expression" ! The constant play of the emotions continually is recorded by changing facial expression.

Animals are quite unconscious of these expressions; they are always genuine and accurately portray their emotional state. Young children are also apt to be frank and genuinely reveal the state of mind; while older humans voluntarily control more or less their responses to every emotion, desire, or thought, and thus modify the facial expressions brought out in all their social contacts. At one moment we may exaggerate, at the next we may inhibit our natural expressions in our efforts to amuse or mystify, to convince or deceive those with whom we constantly associate.

Yet, despite this frequently exercised cortical voluntary control, the constant subcortical emotional impulses, with their inevitable responses in the facial muscles, in the long run gradually mold the visages of every one and imprint upon the face the unmistakable evidence of character. The trite saying, "The face is the mirror of the soul," is undoubtedly well founded. Thus, as shown in the illustrations which follow this paper, we find the expression of serenity in the face of the Madonna, produced by perfect contentment of mind; the spiritual expression of resignation in the face of Christ, produced by persecution patiently borne; the careworn, determined expression in the face of Lincoln, produced

by an unending heavy weight of responsibility; the expression of jollity produced by freedom from care in the faces of the friars in the well-known picture by Grutzner; the sly expression in the face of Shylock, produced by intense cupidity; and the expectant expression in the face of Micawber, produced by constant hopefulness. And so on, *ad infinitum*.

It is very interesting in looking up the literature on the subject to learn that the most elaborate and finished work on facial expression was written more than a century ago by Sir Charles Bell.[1]

His work, "The Anatomy and Philosophy of Expression" (1872 Edition), is beautifully and perfectly illustrated with drawings which he himself made. Taken from numerous ones, both of men and of animals, sketches illustrating laughter, weeping, fear, pain, jealousy, and remorse are shown in connection with this article as characteristic expressions of Man.

He analyzed and compared the nuances of facial expression in Man and the lower animals. He pointed out the simpler muscular apparatus of the lower animals required for their needs as compared with the more elaborate mechanism required by humans.

Following the publication of this well-known work, facial paralysis was called "Bell's Palsy," and the condition is still usually designated by that name.

It is remarkable that such accurate observations on the mechanism by which facial movements are brought about; such a keen interpretation of the difference between emotional and voluntary control; such a knowledge of the conveyance of motor and sensory impulses, should have been brought out at this early date.

[1]Sir Charles Bell was born in Edinburgh in 1774 and died in 1842. He was an artist, scholar, anatomist, and surgeon. He was appointed surgeon to the Middlesex Hospital, London, in 1812. He treated many wounded after the Battle of Waterloo.

The discussion of the whole question of facial expression in connection with the masterpieces of painting by great artists is most illuminating.

A careful reading of the work is well worth while by any who would gain a deeper knowledge of the subject.

The facial nerve, in its long and devious course through the temporal bone, is so deeply situated and is surrounded by a bony tube of such ivory-like density that usually it escapes the feeble efforts of the timid operator, uncertain of his anatomy, or the wilder onslaughts of the boldest bungler.

Yet, in far too many instances, neither timidity on the one hand nor boldness on the other has been successful in preventing the accidental injury of the nerve with its resulting appalling facial palsy. Occasionally, disease of the bone itself may encroach upon the nerve so closely that the inflammatory swelling may cause a paralysis; or so that its operative removal, however skilfully attempted, may result in an injury of the nerve.

Small wonder then that a malady which impairs or destroys this play of expression so manifest in every individual has always engaged the attention and sympathy of the medical profession. The incidence of a facial palsy has always stimulated every possible effort on the part of physician and surgeon to relieve or cure the resulting grotesque appearance.

When surgery of the temporal bone had so advanced that operators no longer feared to invade this particular region, the results were twofold. On the one hand, there were those who were possessed of an extreme fear lest they should even touch the facial nerve. Facial paralysis must be avoided at all costs! On the other hand, there were those who, fired by overenthusiasm or overconfidence, were less cautious. Consequently, unskilled surgery of the temporal bone brought

with it an ever-increasing number of cases of accidental facial paralysis.

Confronted by these lamentable facts in the next decade, constructive efforts to repair the palsies resulting from these accidents were made by several men.

In 1895, Sir Charles Ballance, of London, united the spinal accessory nerve to the facial. A few years later, he employed the hypoglossal, the descendens noni, the glosso-pharyngeal. This method of anastomosis, with improving technique, was employed in Germany, France, England, America, and, in fact, throughout the world.

Brilliant as were the successes in many of the reported cases, there remained always something to be desired. In nearly all, the restoration was incomplete; the use of the muscles was always voluntary (an educated movement) and usually accompanied by associated movements. The so-called emotional response—the reaction in the facial muscles to impulses from the centers in the brain—was always lacking.

In 1930, Sir Charles Ballance invited me to collaborate with him in some animal experimentation to discover if possible some method by which the operative treatment of facial palsy might be improved. It is not difficult to imagine with what alacrity I grasped the opportunity to sit at the feet of Gamaliel! For thirty years, I had on every possible occasion made what I called my pilgrimage to the shrine of St. Thomas![2]

During all these years, in addition to a most active hospital and private practice, he had found time for surgical research. He was past master at everything he undertook and the

[2]Mr. Charles Ballance was for many years surgeon-in-chief to St. Thomas' Hospital in London. During the Great War, he was in supreme charge of the surgical work in the Mediterranean. At Malta alone, he had 29,000 beds under his supervision. He was knighted for his distinguished service and is now known as Sir Charles Ballance, K.C.M.G., C.B., M.V.O., L.L.D., F.R.C.S.

most indefatigable worker I have ever known. I hastened to make the possibility of working with such a man an actuality.

Aided by funds from four foundations and a few personal friends, we constructed an animal laboratory at my country place at Holmes, Dutchess County, New York, where we might work in undisturbed quiet, and where the equipment and surroundings were such that the animals could be kept in perfect health for indefinite periods.

We finally demonstrated that a direct repair of the injured facial nerve might be made by the use of autoplastic nerve grafts. We employed many different nerves—both motor and sensory; any length we desired—either reversed or unreversed. They all were successful. The facial movements were restored without any associated movements; moreover, emotional response, as well as voluntary control, of the facial muscles, was restored.

The principles which we evolved from the animal experiments have been applied to the restoration of the facial nerve in human patients. I have, in the past year and a half, operated on sixteen cases at the Manhattan Eye, Ear, and Throat Hospital. Some of the earlier cases at present have almost perfect restoration. They have both voluntary control and emotional response. Many others are rapidly improving. It is too early to predict how complete the recovery will be. Cases of long standing recover less fully owing to the atrophy of the muscles. The pictures are those of four of the earlier cases. (Figs. 13-24 inclusive.)

Now, in all these cases, both animal and human, the long wait for results after the grafts had been transplanted was very irksome. During the past six months, I have endeavored to improve the technique by using, for graft material, transplants from nerves which have been severed and allowed to remain *in situ* until they had undergone certain degenerative

changes which must take place in all injured nerves before regeneration can occur.

It has been well known over a long period of years that the distal segment of a divided nerve goes through a process of degeneration in which the active nerve cells are broken down and the detritus removed by the circulation; the remaining empty tubules are then ready to conduct new neurons which grow in from the proximal segment. This degeneration must take place in the transplanted graft as well as in the distal segment. As a matter of fact, the graft becomes a part of the distal segment, behaving in the same manner; whereas the proximal segment does not undergo the process of wallerian degeneration.

The process necessarily goes on much more laboriously where the new circulatory apparatus in the transplanted graft is being reproduced slowly. It therefore seems reasonable that the degenerative process and cleaning of the tubes should take place much more rapidly when the nerve, which is subsequently to be used for the graft, is allowed to remain *in situ* for a time after being severed. This process takes from two to four weeks. The graft material seems to be at its best in from two to three weeks.

The tubules at this time have a strong attraction for the neurons which are pushing in from the proximal segment. They pass through with almost incredible speed and on into the distal segment. Their eventual termination in the end plates in the muscle fibres is heralded by a returning response to faradic stimulation. This response returned, in the last animal which I operated, thirteen days after a transplant of ten millimeters of degenerated anterior femoral cutaneous nerve had been placed in the divided facial nerve.

The experiment was first tried in a series of Rhesus monkeys. The results were amazing. In from two to four weeks,

when degenerated grafts were used,responses were obtained which it had taken as many months to accomplish when fresh grafts had been employed.

I have now used the same method on three humans. In two of them, I have already noted responses after thirty days which have never, after the employment of immediate grafts, been noted in less than from ninety to two hundred and forty days. It seems probable that the use of "prepared" grafts (degenerated *in situ*) will shorten the time and improve the quality of the restored function.

In every case, it seems probable that direct repair by grafts will be the operation of choice over anastomosis with other nerves, except in the rare instances in which the palsy has been caused by an intracranial lesion.

The research, which led up to the gratifying improvement in results in the surgical treatment of this appalling malady in humans, has been made possible by generous contributions from the Milbank Memorial Fund, the Carnegie Corporation, the Lillia Babbitt Hyde Foundation, the New York Foundation, and a number of personal friends.

The writer and Sir Charles Ballance collaborating have performed well over 200 operations on baboons, monkeys, and cats. More than six hundred anesthesias have been administered in operations and subsequent tests. It can truly be said that in all these animal experiments, attention to feeding, care, and avoidance of pain or suffering have been carried out as punctiliously as if the subjects had been human.

Perhaps no better argument could be presented for the cause of animal experimentation, employed for the relief of human suffering, than these results bring out. Without the experiments, the technique could hardly have been perfected in two or three generations to the point it has now reached in two or three years.

I am happy to report that the Royal College of Surgeons of England, in recognition of the merits of the work, has awarded the Lister Prize to Sir Charles Ballance. He will deliver the Lister Prize Lecture before the Royal College in April, 1933.

The list of our published works is appended. I have borrowed from all of them in this casual résumé. I wish to express my thanks to the publishers for permitting the use of the illustrations.

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A Note on the Operative Treatment of Facial Palsy. Sir Charles Ballance. British Medical Journal, April 30, 1932, pp. 787-788.

The Effects of Stimulation of the Hypothalmic Pupillo-Dilator Centre after Successful Anastomoses between the Cervical Sympathetic and Certain Motor Nerves. John Beattie, M.D., Arthur B. Duel, M.D. and Sir Charles Ballance. Journal of Anatomy, April, 1932, lxvi, pp. 283-299.

A Note on the Result which follows the Grafting of the Raw Peripheral End of the Divided Cervical Sympathetic Nerve to Another Nerve in the Vicinity. Arthur B. Duel, M.D., and Sir Charles Ballance. Brain, *55*, Part 2.

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Surgical Treatment of Facial Palsy—Ballance-Duel Method. Arthur B. Duel, M.D. The Laryngoscope, August, 1932, xlii, pp. 579-587.

Clinical Experiences in the Surgical Treatment of Facial Palsy by Autoplastic Nerve Grafts. The Ballance-Duel Method. Arthur B. Duel, M.D. Archives of Otolaryngology. In press.

History and Development of the Surgical Treatment of Facial Palsy. Arthur B. Duel, M.D. Surgery, Gynecology and Obstretics. In press.

Illustrating Dr. Duel's Article

IMPROVED TECHNIQUE IN THE SURGICAL TREATMENT OF FACIAL PALSY

Showing the importance of facial expression in reflecting human character . . . and the application of the Ballance-Duel method in the treatment of facial palsy

Illustrating Dr. Duel's Article

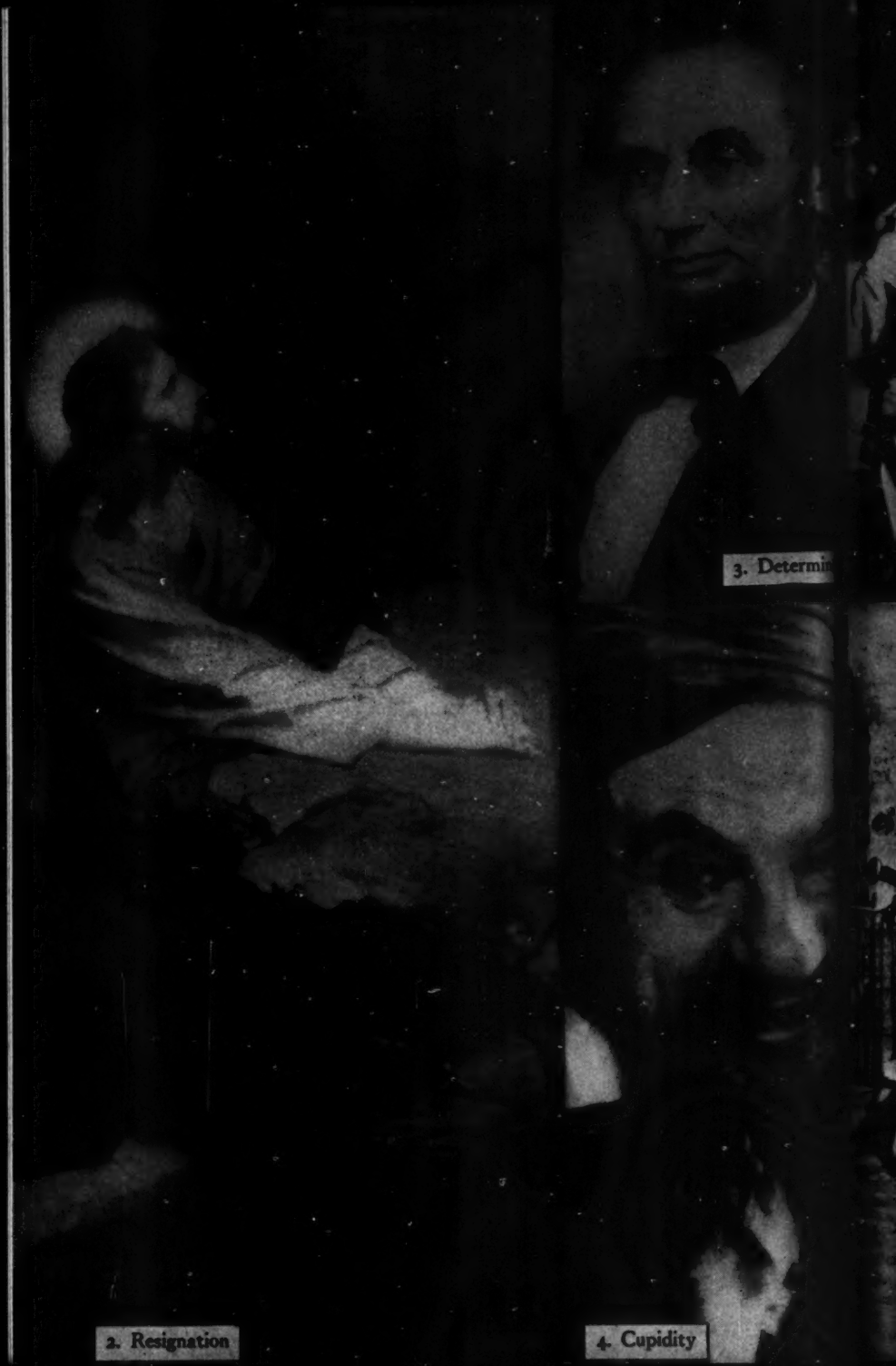
The Face is the Mirror of the Soul. "The constant subcortical emotional impulses," says Dr. Duel, "with their inevitable responses in the facial muscles, in the long run gradually mold the visages of every one, and imprint upon the face the unmistakable evidence of character. The trite saying, 'The face is the mirror of the soul,' is undoubtedly well founded." Reproductions of well-known pictures show how facial expressions reflect lasting traits of character as well as fleeting emotional moods.

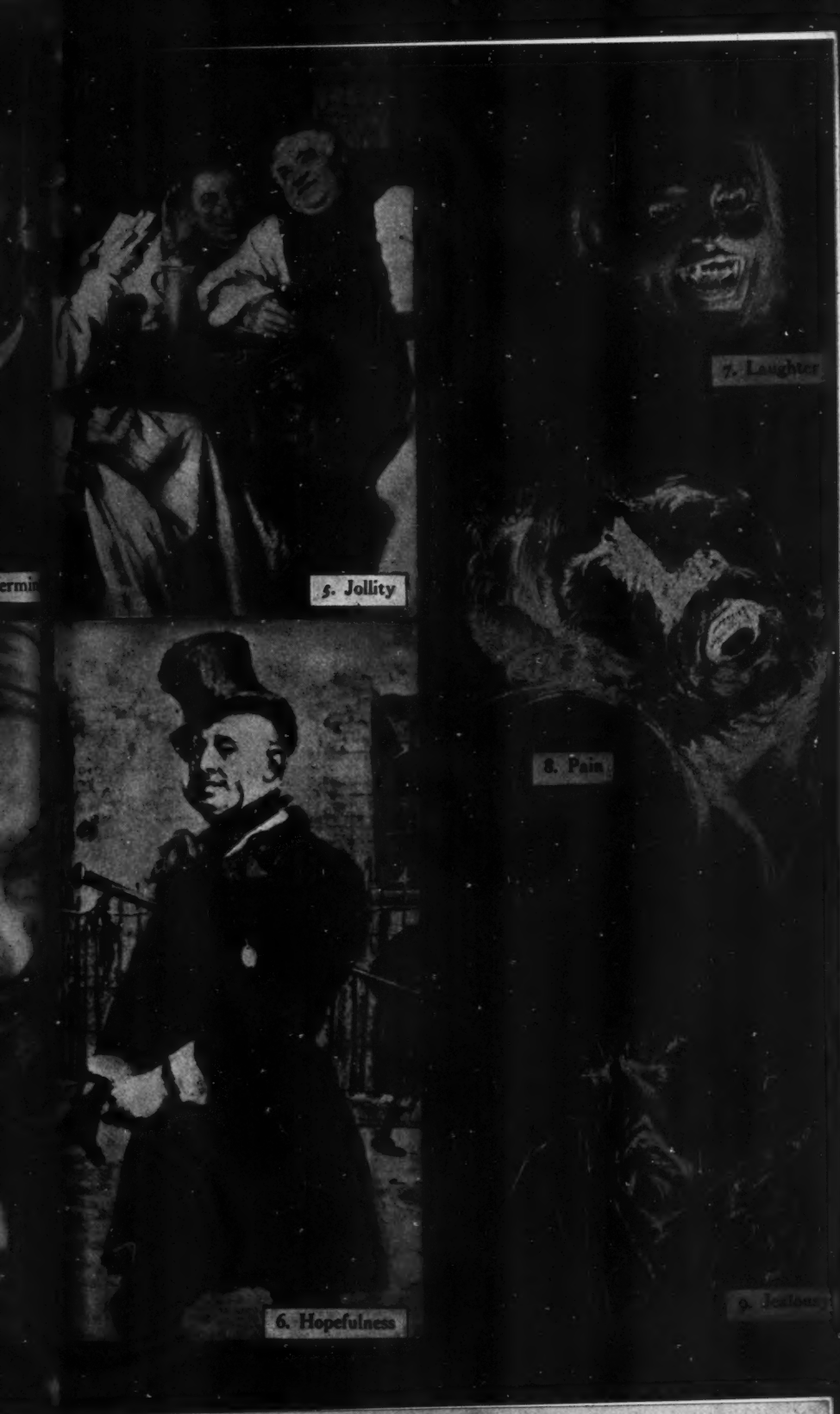
Figures 1 to 6 illustrate serenity, resignation, determination, cupidity, jollity, and hopefulness. Figures 7 to 12, taken from Sir Charles Bell's "The Anatomy and Philosophy of Expression," published more than a century ago, depict laughter, weeping, fear, pain, jealousy, and remorse.

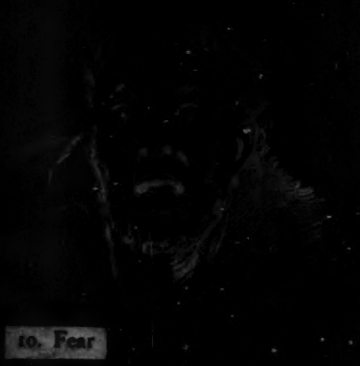
Restoring Expression to Paralyzed Faces. "The incidence of a facial palsy," Dr. Duel declares, "has always stimulated every possible effort on the part of physician and surgeon to relieve or cure the resulting grotesque appearance." By experiments in a method of surgical treatment, the author, collaborating with Sir Charles Ballance, "finally demonstrated that a direct repair of the injured facial nerve might be made by the use of autoplastic nerve grafts." Photographs of four patients indicate the degree of success with which surgical treatment was carried out.

Figures 13, 16, 19, and 22 show patients at the time of undergoing operations for facial palsy. Photographs made some months after each operation indicate the success of surgical treatment, Figures 14, 17, 20, and 23 showing facial expression in repose, and Figures 15, 18, 21, and 24 showing the effects of emotional contraction on the patient's expression.

1. Serenity


3. Determin
2. Resignation
4. Cupidity


5. Jollity
7. Laughter
8. Pain
6. Hopefulness



10. Fear

11. Weeping

12. Remorse

13. Baby G. Before

14. Baby G. Fourteen months after

15. Baby G. Fourteen months after

14. Baby G. Fourteen months after

16. Mrs. B. Before

17. Mrs. B. Eleven months after

18. Mrs. B. Eleven months after

19. Mary A. Before

20. Mary A. Three months aft

22. Mary Y. Before

23. Mary Y. Seven months after

24. Mary Y. Seven months after

THE COMMITTEE ON THE COSTS OF MEDICAL CARE PRESENTS ITS FINAL REPORT

THE first comprehensive study of the costs and distribution of medical service in the United States, has been concluded by the Committee on the Costs of Medical Care in a final report which is arousing many expressions of conflicting opinions regarding the changes recommended. The Committee, headed by Dr. Ray Lyman Wilbur and consisting of forty-eight members representing points of view of the medical profession, economists, sociologists, business men, and laymen, has been at work for five years. The results represent an investment of one million dollars granted by foundations, one of the first supporters being the Milbank Memorial Fund which gave $255,000.

The final report of this Committee, published in December, 1932, by the University of Chicago Press under the title, "Medical Care for the American People," summarizes and interprets the findings of fact previously published in twenty-six separate reports, and presents final recommendations by a majority of the Committee and by minority groups.

How to provide satisfactory medical service at costs which can be met without undue hardship by all people except the indigent while providing fair remuneration for the medical profession was the fundamental problem the Committee five years ago set out to investigate. It found that, at present, 38 per cent of the people in this country receive no medical, dental, or eye care, although its final report does not estimate how many of them needed such care. The rest are served very unevenly, with uneven costs, and with some doctors receiving too little money for doing the same work that pays others well. Meanwhile, nearly half a billion dollars a year is expended for patent medicines and "quacks."

As a cure for these and other ills, the Committee in its majority report prescribes organization of medical service in community medical centers and in groups of doctors; more public health service; payment in the form of small but regular fees, the same for everybody, through voluntary insurance in communities or groups of persons,[1] or through taxation or both; raising standards and cutting out overlapping work in counties, towns, cities, and states through the watchful help of councils specially organized, and better professional education for doctors and nurses. The objections to the majority report and the counter-recommendations by different minority groups and dissenting statements of individual members of the Committee will be discussed in connection with the following more detailed summary.

THE FACTUAL FINDINGS

Whatever differences of opinion there may be, the Committee has assembled and analyzed a vast amount of information never before available in one place. A few of the outstanding facts will illustrate the scope of the Committee's work.

More than one million American citizens make their living in the broad field of medical care and protection of health. For their services and for medicines, the American people spend three and a half billion dollars a year. This, if collected as a head tax, would be about thirty dollars each for every man, woman, and child in the country. There are nearly 7,000 hospitals with nearly one million beds. Nearly three-fourths of all patient-days of service are rendered by governmental institutions.

Full credit is given the medical profession for the remarkable advance of medicine both as an art and a science. The

[1]Several members signing the majority report favored compulsory insurance for states, especially the industrial states.

report says: "Physicians and other men of science have displayed an unparalleled generosity in making available to their colleagues and thus to mankind the results of their research and inventive genius." In contrast to this, medicine as an economic activity has made less progress, and its "predominant economic institution—private individual practice —dates back to ancient times."

The facilities for medical care "are not distributed according to needs, but rather according to real or supposed ability of patients to pay for service." For example, in 1929, there was one physician to every 1,431 persons in South Carolina as against one to every 571 in California, and one to every 621 in New York State.

Sickness falls alike on the rich and the poor, the survey reveals, and yet nearly two million families in the United States, whose incomes are less than $1,200 a year, "receive no professional medical or dental attention of any kind, curative or preventive," and this "in spite of the large volume of free work done by hospitals, health departments, and individual practitioners, and in spite of the sliding scale of charges." However, even the well-to-do families receive less medical care than they should have, according to standards accepted by the Committee. Most Americans stay away from dentists. "Among the mass of the population, only 21 per cent of individuals secure any dental care during an average year."

Preventive medicine is still little used. In any one year, less than 7 per cent of the population has even a partial physical examination and less than 5 per cent is immunized against some disease. The Committee refers to a special survey for the White House Conference which showed that only 51 per cent of city children and only 37 per cent of rural children had health examinations prior to their sixth birth-

day, and that only 21 per cent of city children and only 7 per cent of rural children have been vaccinated by the time they are six.

"American communities have been pitifully backward in utilizing modern public health procedures," says the Committee. Of the $30 per capita spent for prevention and care of disease, only $1 has been used for federal, state, or local public health service. In cities of 100,000 population, where satisfactory service calls for $1.79 to $2.13 per capita, the current expenditure is only 65 to 80 cents, and in county and rural health work, for which experts recommend $2.50 per capita, the expenditure averages less than 35 cents.

Meanwhile, perhaps a billion dollars a year spent to preserve or regain health is wasted, according to the Committee, by expenditure on "patent medicines," healers, and on inferior services, and by inadequate use of hospitals and of time and equipment of practitioners.

Most of what has been summarized above, though it will astonish the average citizen if he stops to think about it, will not long stay in his mind. But what he never forgets is that he cannot predict, nor can his doctor, how much money he may have to spend next year, or the year after, for doctors', hospital, and dentists' bills. "On the present fee-for-service basis, it is impossible for 99 per cent of the families to set aside any reasonable sum of money with positive assurance that that sum will purchase all needed medical care." Of the total money income in the United States, 4 per cent is spent for medical care. But "if a family lays aside for medical costs 4 per cent of its annual income (say $110), it may spend only $10 or it may spend $1000."

In 1928, nearly thirteen million families in this country had incomes of less than $2,000 a year, while only two and a half million had incomes above $5,000. Per capita income in

1926 varied according to geographical location from an average of $369 in four southern states to an average of $1,309 in the Middle Atlantic States. Besides the great disparity between actual and average incomes for a large majority of families, there is perhaps a greater disparity between actual and average costs of medical service.

The pay for the medical profession is also very uneven. While the average net income for physicians in 1929 was $5,300, half of them received less than $3,800, and one-third received less than $2,500. One-sixth of the physicians, however, received net incomes of more than $10,000. The average income of the rural practitioners is less than one-half of the average for metropolitan physicians.

Forty per cent of gross income of private practitioners goes for overhead, which raises the cost to the patient without financial return to the doctor. Collections, in 1929, were 10 to 20 per cent less than the amounts charged. From 1929 to 1930, the depression reduced professional net incomes 17 per cent, on the average. In four southern states, the reduction was 50 per cent. Discussing the hospital situation, the Committee questions "whether the voluntary hospital system in America can survive" in the face of reduced incomes from private philanthropy and community funds and increased demand for free service.

The capital investment in land, buildings, equipment, and endowment of hospitals and clinics in America amounts to $3,500,000,000. Ninety per cent of this has been provided by government funds or philanthropy.

The total investment in medical and dental service is about $5,850,000,000, of which $3,550,000,000 has been made by the public without expectation of financial return, while $900,000,000 has been invested by physicians and dentists in their own equipment or private hospitals. "An increasing

proportion of medical service," notes the Committee, is by practitioners "who use a capital investment provided by the public for the benefit of the public." About four-fifths of all the physicians in this country are associated with hospitals and clinics.

Drugs and medicines are purchased by the American people to the amount of $715,000,000 a year, of which more than half, "most of which is money wasted," goes for "patent medicines." The costs of medicine to a family, however, are seldom large enough to be a serious item in its budget.

Confusing to the patient is the growing complexity of medicine. There are some twenty-five specialties recognized, and in some communities as many as 30 per cent of the physicians limit themselves to specialization and almost as many more tend toward specialization.

After its summary of the medical situation, above outlined, the Committee cites various authorities and the experience of organizations in America with the system of providing complete or nearly complete medical service for weekly or monthly fees, and concludes that the cost, excluding capital charges, least for urban areas, amounts to twenty to forty dollars per capita per annum.

PRINCIPAL RECOMMENDATIONS OF THE MAJORITY

As a basic consideration for the reorganization of medical services, the Committee stresses the preservation of a personal relation between patient and physician as an essential element in safeguarding the quality of medical practice, but holds that private business relations between physician and patient are not considered necessary. It declares that professionally the family physician should be restored to a position of responsibility and trust. It further advocates a shift of emphasis from cure to prevention, and points out that,

from the economic standpoint, increased prevention will be needed to counteract the larger total expenditures necessary for better care of the sick.

In five formal recommendations, which have been widely published in the daily press, the majority group of the Committee sets forth its program. The keystone of this is the development of one or more nonprofit "community medical centers" in every city of approximately 15,000 population. This would provide complete medical care except for the tuberculous and for mental and other cases of institutional type. Although there might be lay participation in the administrative and financial control of the center, the professional personnel would control the professional work. Remuneration would preferably be on a salary basis, although it might be on a capitation or fee basis, or by a proportional division of receipts.

Affiliated branches of medical centers would be organized for towns with populations of 2,500 to 15,000. For the villages and distinctly rural areas, there would be "medical stations" related to centers or branches. Traveling clinics would be provided for special diseases.

The group does not propose, however, that such centers, branches, and stations should completely displace all existing agencies, nor that individual private practice, particularly among the well-to-do, should be discontinued.

MINORITY DISSENTS AND RECOMMENDATIONS

This proposed organization of medical services is vigorously opposed in a minority report, signed by eight physicians and one layman. This minority declares that the medical center plan "would establish a medical hierarchy in every community to dictate who might practice medicine there." The minority further declares that "it would be impossible

to prevent competition among the many such centers necessary for large cities; cost would inevitably be increased by the organization necessary to assign patients to the various centers," and that "continuous personal relationship of physician and patient would be difficult if not impossible under such conditions."

The clash, in brief, is between those who favor the continuation of the private physician as the unit and those who favor groups of various forms as units of organization. Even private pay clinics are not welcomed by the signers of this minority report. They accuse the majority, which includes seventeen doctors of medicine and one doctor of public health, of being too favorable to such groups. The minority argues that there is no proof that group clinics reduce costs, except by limiting service, as, for instance, by excluding domiciliary service. It holds that in large cities these groups lead to duplication of equipment, and, moreover, engage in competition, thus commercializing and lowering the standards of medicine. It states that "for the 85 per cent of illnesses which make up the family doctor's practice better service can be given by the individual doctor in his own office than in a clinic and at less cost." However, it approves "the development of pay clinics when they are under the management and control of physicians and are conducted on a high ethical plane and are needed to meet a situation."

A second minority report was submitted by two doctors of dental surgery, the only ones on the Committee. These two, while opposing the majority views on insurance, are in favor of group practice.

On the question of sickness insurance, the clash of opinion is even sharper. The formal recommendation of the majority group reads as follows:

"The Committee recommends that the costs of medical

> care be placed on a group payment basis, through the use of insurance, through the use of taxation, or through the use of both these methods. This is not meant to preclude the continuation of medical service provided on an individual fee basis for those who prefer the present method. Cash benefits, i.e., compensation for wage-loss due to illness, if and when provided, should be separate and distinct from medical services."

Although the formal recommendation does not qualify the word "insurance" it is made clear in the discussion that voluntary nonprofit systems are meant, systems which would organize "industrial, fraternal, educational, or other reasonably cohesive groups." Eight members of the majority group dissent on this point and demand state-wide compulsory insurance in industrial states for certain income levels, certain occupations, or certain areas. They argue that voluntary insurance will never cover those who most need its protection, and that it will be more complex, more difficult to administer, and, in the long run, less economical than compulsory insurance. Professor Walton H. Hamilton, one of the two members of the Committee submitting individual statements, declares that compulsory insurance is the very minimum which the Committee should have recommended.

The nine signers of Minority Report Number One oppose voluntary sickness insurance not under control of the medical profession, declaring that where such systems have already been tried in America they are "giving rise to all the evils inherent in contract practice." They argue that if we must adopt insurance, the sensible and logical plan would be to adopt compulsory insurance under government control. They point out that in Europe voluntary insurance has usually led to compulsory insurance, but they add that the objections to the latter system are almost as compelling as are those to the former. However, in the further discussion, they say

that they are "not opposed to insurance but only to the abuses and evils that have practically always accompanied insurance medicine." They suggest that a form of sickness insurance based on experiments already tried by county medical societies may be the solution of the problem. The two signers of Minority Report Number Two strongly endorse this view.

Majority recommendations on which there were few if any differences in the Committee, call for the extension of all basic public health service; formation of agencies to evaluate and coordinate medical services; and broader and more complete professional education and training.

In a statement appended to the report, Edgar Sydenstricker says: "As a member of the Committee, I regret that I cannot see my way clear to sign the final report of the Committee for the reason that the recommendations do not, in my opinion, deal adequately with the fundamental economic question which the Committee was primarily formed to study and consider."

General comment on the report indicates appreciation of the value and importance of the work accomplished by the Committee on the Costs of Medical Care. A sound basis has been laid for further consideration of the way to provide adequate medical service for all the people with adequate pay for all the doctors.

GROWING INTEREST IN ECONOMICS OF MEDICAL CARE

VARIOUS means of making the benefits of medical science more completely available to mankind are being widely discussed. Problems which have arisen in America are set forth in the final report of the Committee on the Costs of Medical Care, which is reviewed in this number of the *Quarterly Bulletin*. Administrative procedure in Russia will be described in a book now under preparation by Sir Arthur Newsholme and John A. Kingsbury, secretary of the Milbank Memorial Fund, based on a recent personal survey. National health insurance as exemplified in various European countries has been examined by Sir Arthur Newsholme in his "International Studies," and more recently by Dr. G. F. McCleary, in a book entitled "National Health Insurance," published by H. K. Lewis and Company, Ltd., London. This volume is based on lectures given at the School of Hygiene and Public Health in The Johns Hopkins University.

Dr. McCleary, formerly principal medical officer of the National Health Insurance Commission of England and a deputy senior medical officer of the British Ministry of Health, notes "a tendency among nations to place health insurance on a compulsory basis." He gives as a reason that experience proves that only relatively few wage-earners can be relied on to take advantage of voluntary insurance. He also notes that "the number of occupations covered by compulsory health insurance tends to increase," and that there is a further expansion of the system by extending medical service to dependents of the insured. Meanwhile the provision of medical services tends to become relatively more important than the provision of cash benefits, which were

formerly the main purpose of health insurance. He points out that there is a growing tendency to separate the administration of cash benefits from the medical services. Increasing influence of the medical profession in the control of the administration and development of insurance is also a tendency. Relating how the depression has tested the stability of insurance systems by reducing the premium income and raising the expenditures for cash benefits, the author points significantly to the fact that in no country has there arisen a movement to abolish compulsory health insurance. In England, the system is evidently secure. Dr. McCleary recalls that, after the English system of national health insurance had been in operation for twelve years, its effectiveness was surveyed by a Royal Commission, which reported in 1926. The British Medical Association stated before this Commission that the insurance system was extending medical service to large numbers previously without care; that treatment was being given at earlier stages of disease; that preventive medicine had gained; and that cooperation among practitioners was being encouraged to an unusual degree. The author reports the Commission's conclusion that "National health insurance has now become a permanent feature of the social system of this country, and should be continued in its present compulsory and contributory basis." Compulsion, it may be added, applies to all persons, male and female, aged sixteen and above, if employed at manual labor, or in nonmanual labor if the pay does not exceed £250 a year.

In nearly all countries, the cost of insurance is shared by the insured, their employers, and the public. It is argued that the contribution by the employee has a profound moral effect upon him. In England he pays a flat rate per week, while in other countries the rate varies with the wage. The employer usually contributes an equal amount. In England,

the government bears the total cost of central administration and, in addition, pays one-seventh of the cost of the benefits to men and one-fifth of the benefits to women.

The benefits under the English system are weekly payments for not more than twenty-six weeks to those rendered incapable of work, disablement benefit for an unlimited period following the cessation of sickness benefit, and maternity benefit. Local administration is in the hands of the so-called Approved Societies and the Insurance Committees.

Doctors who wish to treat insured persons are listed on a "panel," and the insured person has free choice of doctor. On the other hand, a practitioner is not obliged to accept any insured person who wishes to choose him. Remuneration is made on a "capitation" system, that is, with reference to the number of insured persons on the practitioner's list. This system is not the only one permitted in England, but it has become universal there as the one preferred by the doctors. Methods of payment in other countries are: fixed salary, payment per case, and payment per attendance. In France, under the so-called *entente directe*, the doctors' fees are paid directly by the insured person to the doctor, who fixes the fee. The patient is reimbursed according to a tariff which may amount to only a part of the fee charged.

One objection made by critics of health insurance is that it fosters the seeking of cash benefits for absence from work on account of trivial ills. In England, the insured person must obtain from his examining physician a medical certificate of incapacity which is issued only in accordance with rules specially drawn up to govern certification. Should higher authorities doubt the justification of any particular medical certification, they may call for a second examination, which is made by a referee in the Regional Medical Staff. Besides this, there is a statistical check on insurance

doctors. If, after the referee examination, it appears that any one insurance doctor has wrongly certified an unusually high proportion of cases, he is dealt with by the Panel Committee and may be punished by withholding his remuneration or otherwise.

In an historical sketch, Dr. McCleary relates that sickness insurance in England began with the medieval guilds. It reappeared in the mutual aid associations, called Friendly Societies, which had their rise in the middle of the seventeenth century. Daniel Defoe, the author of "Robinson Crusoe," is reported as the first man in England to devise a plan for compulsory health insurance, but he found little support.

Rudimentary schemes with compulsory features were enacted for certain localities and occupations in England during the eighteenth century, but, Dr. McCleary says, they led nowhere. Modern schemes of compulsory insurance, he points out, are related historically to the enactment by Germany in 1884. The British act was passed in 1911.

Sickness insurance in England and Wales, as well as sixteen continental countries, was one of the principal subjects engaging the attention of Sir Arthur Newsholme in his survey recently completed for the Milbank Memorial Fund. Press clippings received since the last issue of the *Quarterly Bulletin* show continued interest in his "Medicine and the State," published last year as the fourth volume giving results of the survey. This volume interprets the factual findings in the three earlier volumes, "International Studies on the Relation between the Private and Official Practice of Medicine, with Special Reference to the Prevention of Disease."

"The publication of these volumes," says the *British Medical Journal*, London, referring to all four books," is a

fine testimony to the breadth of knowledge and sympathy of their author. They are indispensable to persons engaged in public health affairs and to all interested in medical politics." Reviewing "Medicine and the State," *The Lancet*, London, says that these studies of Sir Arthur Newsholme "will be indispensable to those who wish to prepare their minds for some of the medico-political problems of the future." *The Journal of the Medical Association of South Africa*, Cape Town, considers it "rare that such good measure of material in clear, incisive writing on a subject of general importance is presented to the reading public."

Remarking that in "Medicine and the State," Sir Arthur usually "takes a stand midway between those who demand complete nationalization of all medical services and those who regard all State services as 'encroachments,' " the *Press*, Christchurch, New Zealand, pronounces this book "the best and the most unpretentious piece of sociological research that has appeared for many years." *The Cape Times*, Cape Town, speaking of South Africa, feels that the book "should stimulate the profession and the public in this country to make a start, basing our attack on ill-health on the general lines of policy that in other countries have proved so singularly successful." The *Manchester Guardian* says that Sir Arthur "deals with many thorny questions plainly and impartially. He will not satisfy the extremist of any school. But if he is free from propaganda he is by no means without convictions and he insists that what is best for the patient is best for the doctor and for the community."

PUBLIC HEALTH, as a social function, is concerned not only with direct measures for the prevention of disease and the education of the public in hygiene, but also with the prevention of conditions that are harmful to health. Among these deleterious conditions are too frequent births and too large families in certain groups of the population, and, possibly, too infrequent births in other groups. If efforts to correct these conditions are to be undertaken intelligently, then it is necessary first to understand what the causes of these conditions are and what social, economic, and other factors are involved, as well as to discover the most efficient remedies.

This is the primary purpose of the Fund's studies in "population problems."

Professor Pearl's study will throw light upon some of the factors that are involved in the striking contrasts in size of families in different social classes which other studies by the Fund's staff have shown to exist. His preliminary findings as to the actual extent to which birth control is practiced in one moiety of the population undoubtedly will be surprising to many.

PRELIMINARY NOTES ON A COOPERATIVE INVESTIGATION OF FAMILY LIMITATION[1]

by RAYMOND PEARL

IT is common and undisputed knowledge that birth rates, however measured, have generally and with but few exceptions been falling for a considerable time past in most countries keeping such records. This is an obviously important phenomenon. But what the student of population wants to know is something about the causal factors—biological, social, economic, and/or other—lying behind the phenomenon. It is true that there can be, and has been, some definite progress made towards an understanding of the part played by some of these factors through a study of the meager official data furnished by census and registration officers referred to above. But in most such cases the investigators have been hampered and limited by the paucity and lack of penetrating relevance of the available data. This has led to the development of special studies of various aspects of the problems of human fertility, involving the collection of *ad hoc* data from diverse sources and in different ways. While there may be in some cases statistical defects and disabilities in such special studies, they have materially advanced knowledge and broadened the point of view regarding some of the basic problems of human population here under discussion. If well conceived and carried out, they have the enormous advantage of attacking more precisely formulated, more penetrating, and more significant questions than can

[1]From the Department of Biology of the School of Hygiene and Public Health, The Johns Hopkins University; and the Division of Population Problems of the Milbank Memorial Fund. This paper is a condensed abstract of a preliminary report entitled "Contraception and Fertility in 2,000 Women," appearing in *Human Biology*, September, 1932, iv, No. 3. That detailed report should be consulted by anyone particularly interested in the subject.

usually be attacked with only official government statistics as material. The Milbank Memorial Fund has, in recent years, been particularly active in this field of endeavor.[2]

It is generally agreed by all persons competent to have an opinion on the subject that the practice of contraception (birth control) is a factor at least potentially capable of influencing the birth rate. There is no such widespread agreement as to how significant a factor it has been, and is now, in causing the decline of birth rates. Some persons think it is the only factor worthy of serious consideration. Others are of the opinion that it has played no significant role, up to the present time, in the movements of the birth rates of large population aggregates. Still others hold an intermediate position somewhere between these extremes.

There are several immediately apparent reasons for this diversity of opinion. In the first place, no one really *knows* how extensively contraceptive measures of any sort are actually used in the general population of any country. Secondly, for emotional or propagandist reasons, exaggerated inferences, in one direction or the other, are drawn from meager experience, statistically considered. The leaders of the birth control movement, for example, argue that information on contraceptive technique should be widely disseminated, because relatively few know anything about it. On the other hand, those opposed to birth control argue that already information on the subject is so widespread, and

[2] *Cf.*, for examples, Sydenstricker, Edgar, and Notestein, F. W.: Differential Fertility According to Social Class. A study of 69,620 native white married women under 45 years of age based upon the United States Census returns of 1910. *Journal of the American Statistical Association*, March, 1930, xxv, New Series, No. 169, pp. 9-32; Notestein, F. W.: The Decrease in Size of Families from 1890 to 1910. Milbank Memorial Fund *Quarterly Bulletin*, October, 1931, ix, No. 4, pp. 181-188; Sydenstricker, Edgar: A Study of the Fertility of Native White Women in a Rural Area of Western New York. Milbank Memorial Fund *Quarterly Bulletin*, January, 1932, x, No. 1, pp. 17-32.

the technique is put into practice so generally, as even to endanger the continued existence of some of the racial groups standing highest in the scale of civilization. Both sides to this controversy are in possession of the same objective evidence. One side knows nothing that the other does not know relating to what may be euphemistically called the "facts" in the case. But they reach opposite conclusions.

In the third place, there exists almost nothing in the way of critical, objective, unbiased evaluation of the effectiveness of any or all contraceptive techniques, as actually practiced in the population. If a few special studies are excepted, nearly all the so-called evidence as to the effectiveness of contraceptive practices comes from persons or organizations interested in birth control propaganda. There is considerable confusion of thought about the difference between the potentiality and the actuality of effectiveness of contraceptives. A highly intelligent woman, thoroughly trained in biology in a university and obsessed with an overwhelming fear of unwanted pregnancy, may be able to use a particular contraceptive device with unfailing success. But it cannot be safely concluded from this fact that this contraceptive device is, or will be, equally effective as actually used by all women who resort to it in the general population. Nor can it be safely inferred from the same premise that birth control is a major factor in causing the decline in the birth rate.

What has been said may perhaps be taken to have set with sufficient clarity the background of the two problems with which this present investigation is concerned. These problems may be stated concisely as follows:

1. To what extent statistically is any sort of contraceptive technique, device, or habit actually practised in a defined sample of the population of the United States at the present time?

2. What is the quantitative effectiveness exhibited by the various contraceptive techniques, considered both separately and all together, in reducing the relative frequency of pregnancy, as these techniques are actually used in a defined sample of the population of the United States at the present time?

THE PLAN OF THE INVESTIGATION

The study was started originally in 1924, but languished for lack of funds for its successful prosecution until the Autumn of 1929, when an interest was expressed by Edgar Sydenstricker and John A. Kingsbury of the Milbank Memorial Fund to have the project continued on an adequate scale. This was made possible by a substantial grant for the year 1931, which was continued on a somewhat larger scale for the year 1932. I wish to express here my deep appreciation and gratitude for this aid.

With funds available to carry on the work, the initial plans were critically reviewed and revised. At my request, the following persons agreed to serve as an advisory committee in connection with the project: Dr. Carl G. Hartman, Dr. John R. Miner, Professor Lowell J. Reed, Edgar Sydenstricker, and the late Dr. J. Whitridge Williams, with the writer as chairman. I am very grateful to this committee for help in getting the project soundly organized. The staff began work on July 1, 1931, and the inflow of record cards started in August.

The plan of the investigation, in briefest outline, was to have filled out a simple but rather comprehensive history card for each woman delivered of a baby in the obstetric services of hospitals located in or near large cities east of the Mississippi River. The history carries basically two broad categories of information; first, the entire reproductive history of the woman, and, second, an account of her use of

HOSPITAL
OBST. NO.

DATE OF DELIVERY

LEGIT. OR ILLEGIT.

DO NOT WRITE IN THIS SPACE

COLOR: W. C.

RACE STOCK

RELIGION

HAS PATIENT ANY GYNECOLOGICAL DISEASE? IF SO SPECIFY.

REPRODUCTIVE HISTORY
INCLUDING PRESENT ADMISSION

HAS PATIENT EVER USED ANY METHOD FOR PREVENTION OF CONCEPTION? YES. NO.
(FILL IN DETAILS ON OTHER SIDE OF CARD)

PREGNANCY	YEAR	RESULT
1		L. S. M. T. O.
2		L. S. M. T. O.
3		L. S. M. T. O.
4		L. S. M. T. O.
5		L. S. M. T. O.
6		L. S. M. T. O.
7		L. S. M. T. O.
8		L. S. M. T. O.
9		L. S. M. T. O.
10		L. S. M. T. O.
11		L. S. M. T. O.
12		L. S. M. T. O.
13		L. S. M. T. O.
14		L. S. M. T. O.
15		L. S. M. T. O.

DATE OF BIRTH OF PATIENT?

DATE OF BIRTH OF HUSBAND?

DATE OF MARRIAGE?

OCCUPATION OF HUSBAND?

WARD, PAY, OR PRIVATE PATIENT

EDUCATION OF PATIENT: ILLITERATE / ELEMENTARY SCHOOL / HIGH SCHOOL / COLLEGE

ECONOMIC POSITION: VERY POOR / POOR / MODERATE CIRCUMSTANCES / WELL-TO-DO / RICH

HAS PATIENT EVER HAD SELF-INDUCED ABORTION? YES. NO.

HAS PATIENT EVER HAD ABORTION INDUCED BY SOMEONE ELSE? YES. NO.
(IF ANSWER IS YES IN EITHER CASE, DESCRIBE METHOD USED)

NOTES:

L=LIVE BABY. S=STILL BORN.
M=SPONTANEOUS MISCARRIAGE
T=THERAPEUTIC ABORTION.
O=OTHER ABORTION

THIS CARD WAS FILLED OUT BY:

OVER

Fig. 1. History card used in the investigation. Obverse.

METHODS OF CONTRACEPTION USED
(TO BE FILLED IN WITH AS MUCH DETAIL AS POSSIBLE)

METHOD	CHECK USE	HOW LONG WAS EACH OF SPECIFIED METHODS PRACTISED?	WHAT IS PATIENT'S OPINION AS TO EFFECTIVENESS OF METHODS SHE HAS USED?
COITUS INTERRUPTUS (WITHDRAWAL)			
CONDOM { RUBBER / SKIN			
PESSARY ALONE			
PESSARY WITH MEDICATED JELLY			
PESSARY WITH DOUCHE			
MEDICATED VAGINAL SUPPOSITORIES OR JELLIES*			
DOUCHE ALONE—WATER			
DOUCHE ALONE—MEDICATED*			
INTRA-UTERINE MECHANICAL DEVICE*			
"SAFE PERIOD" (ABSTINENCE DURING PART OF MONTH)			
ANY OTHER METHOD*			

* SPECIFY KIND HERE:

DO NOT WRITE IN THIS SPACE

OVER

Fig. 2. History card used in the investigation. Reverse.

contraceptives. The history card actually used—5 x 7 inches in size—is shown in facsimile in Figures 1 and 2.

The cooperating workers were furnished detailed written instructions, which began as follows:

> "The purpose of the investigation is to gather a mass of unbiased, objective information relative to two primary problems, viz.: (1) the extent to which contraceptive (birth control) practices are employed by women in a large sample of the American urban population; and (2) the reproductive histories of this group of normal American women.
>
> "The plan for accomplishing this purpose, in which you are asked to cooperate, involves the following elements:
>
> "1. The regular and systematic filling out of a simple card form for each and every woman delivered in the obstetrical service of the hospital with which you are connected.
>
> "2. These cards will be furnished by the Department of Biology. They will be filled out by a designated member of the staff (resident, interne, or other, but *not* a nurse).[3] For this service a fee of five cents per card will be paid.
>
> "3. The accumulated cards from the previous week properly filled in will be mailed each Monday morning, in self-addressed envelopes which will be furnished for the purpose. You will be reimbursed for the postage.
>
> "4. The data will be analyzed and tabulated in the Department of Biology, and from time to time progress reports upon the investigation will be issued.
>
> "*Primary essentials* to a successful and significant outcome to the investigation are:

[3]The idea of this restriction was that the data should always be taken by medically trained persons, having the confidence of the patient on the one hand, and the technical knowledge and training on the other hand, to ensure the scientific accuracy and completeness of the records. As a matter of fact, as the work progressed it has been necessary in a few cases to employ graduate nurses for the actual record making, working under the supervision of a staff member. In each case they have done the work faithfully and intelligently.

"1. Painstaking accuracy in getting the information and putting it on the cards.

"2. Absence of selection of cases. *Every* case delivered in the hospital should be included.

"3. Systematic and prompt return of the cards to the Department of Biology.

"The supervising field worker will explain the details of the plan and help you to get started. The work began with the leading hospitals in Baltimore, and has gradually extended to other cities in the eastern part of the United States."

There follow many pages of detailed instructions regarding the proper recording of each item of information called for on the card.

When the record cards reach the laboratory they are first checked in, as to numbers and source of origin, for the purpose of (1) keeping track of payments due the workers for the cards and postage, and (2) knowing what to send back to the workers in the way of supplies (blank cards and envelopes) so that their stock on hand may not be unduly depleted.

Each card is then gone over carefully and critically in detail to be sure (1) that each item of information called for has been duly entered; (2) that there are no inconsistencies or ambiguities in the record as it reaches us. If the card satisfactorily passes this scrutiny, it is stamped with a serial number in the upper right-hand corner and filed. If the card does not pass the inspection, a duplicate copy of it, *verbatim et litteratim*, exactly as it reaches us, is made. On this copy are placed blue pencil marks indicating the missing or doubtful items, and this copy, together with a letter discussing the matter and making plain what further information is wanted, is promptly mailed to the worker who originally sent it in, with a request that it be put in order and sent

back to us as soon as possible. In the meantime, the original is held in the laboratory here, without any serial number, until the case is cleared up or it is found impossible to get the desired information. Only when the case has been disposed of in one or the other of these ways is it given a serial number and filed.

The first 2,000 cases reported on in this paper came from thirty-nine[4] hospitals located in Baltimore, Philadelphia, Washington, Chicago, and New York City. The total population of these five cities was 13,549,588 in 1930. As this paper is written, the total number of hospitals cooperating in the work, either during some limited period in the past or regularly, is 131, and the total number of finished cards in the file is 14,495. It is expected that the collection of data will be continued until December 31, 1932. On that date the record taking will be stopped, and the complete analysis of the data pushed forward as rapidly as possible.

SOME CHARACTERISTICS OF THE DATA

In any statistical study it is of the highest methodological importance to examine critically and formulate clearly the characteristics of the sample of the population forming its basis. The extent or degree to which the sample is differentiated (selected) from the population in general should be as clearly apprehended and defined as possible. Such differentiation or selection definitely limits the breadth of possible generalization from the results.

From a statistical standpoint at least, the following general statements may at once be made about the material which has been, and will be, collected in this investigation.

The present data come from a portion of the general popu-

[4]A complete list of the hospitals and the cooperative workers is given in the detailed report of which this is an abstract.

lation of women living in the United States, and represent a *selected* group in respect of the following items, at least:

1. All the women are urban dwellers, in large cities.

The desirability of the study of these problems in rural populations is fully recognized. But we have not yet been able to devise any practical method of getting the data for such population.

2. Each of the women has been delivered of a baby in a hospital at some date since July 1, 1931.

At least two sorts of selection are here implied. The first is consequent to the circumstance that not all women have their babies in hospitals. Whether those who do are differentiated in any important biological characteristics from those who do not is unknown, but also improbable. It is of interest to note that the number of urban women who regularly resort to hospitals to have their babies is larger than might perhaps be supposed. The most recent data[5] available (June 11, 1932) give 708,889 births occurring in 1930 in all hospitals in the United States registered with the American Medical Association. In 1928 (the latest figures available) the total number of births in the United States Birth Registration Area (which was officially estimated at that time to include 94.4 per cent of the population) was 2,233,149. It thus appears that something of the order roughly of a third of all deliveries at the present time are taking place in hospitals. In large cities, the proportion is probably still higher.

The second implied sort of selection is more important. Our sample includes only women who were overtly fertile during the period of the study. No women permanently sterile for physiological or pathological reasons pertaining to themselves or their consorts can possibly be included in the

[5] "Hospital Number" of the *Journal of the American Medical Association*, June 11, 1932, xcviii, p. 2067.

records. No women temporarily sterile during the period of the investigation (July 1, 1931 to December 31, 1932) or during a prior period of nine months before the first date—for any reason whatsoever—can possibly appear in the data.

It is plain that one reason why a woman, who would otherwise fall within our collecting net, had no baby during the period covered may have been that she was practising contraception with 100 per cent effectiveness during that time. To the extent that such women (otherwise eligible) existed, they are automatically excluded from the present data. This means that the present data will insofar underestimate the proportion of women practising contraception in the defined sample. But from this fact the false inference should not be drawn that *all* the women, who would have been delivered in hospital during the period of this study if they had had a baby, did not have a baby because they practised contraception with perfect efficiency. All women who do not practise contraception are not always pregnant. In the present case all that is really known is that otherwise eligible women who did not become pregnant during the period defined above are automatically excluded from the data. There is no logical warrant from this fact alone—and it is again emphasized that this fact is all we know in the premises—to draw inferences as to *why* such women did not become pregnant. To find out these reasons demands a special *ad hoc* investigation, which forms no part of the present purpose of this preliminary paper.

3. There are definite geographical limitations to the data discussed in this paper. These have been noted above.

4. No data were collected from hospitals controlled by the Roman Catholic Church.

The reason for this voluntary limitation on the collecting of material is a simple one. The Catholic Church is officially

opposed to the practise of contraception. Catholic women are included in the data. But they attended non-Catholic hospitals for their deliveries.

In addition to the above differentiations of the present sample from the general population of women, there are some others of a social or economic character which will now be dealt with in separate sections.

Race. In the first 2,000 cases here discussed, 1,390, or 69.5 per cent, were white women, and 610, or 30.5 per cent, were colored (Negro). These proportions have no particular demographic significance. The Negro population of the five cities contributing to the present sample forms a much smaller fraction of the total population than 30 per cent. But some purely Negro hospitals (as the Provident in Baltimore) are included in the records, and others (as Harlem in New York) have a high proportion of Negroes in their clientele. It is probable that as larger numbers of the records are tabulated the percentage of Negroes in the totals will be smaller than in the first 2,000, where the Baltimore and Philadelphia hospitals are rather heavily weighted.

Economic Status. As stated above, the plan of the study was to have *every* woman delivered of a baby in any of the cooperating hospitals included in the records. Early in the work, however, it was made apparent that this was an unattainable ideal. Many obstetricians refused to permit the collection of the information from their private cases, although perfectly willing to cooperate in the completest way so far as concerned ward cases and pay-patients not the private cases of any particular physician. This position automatically and almost completely cuts out of the records women in the higher economic and social brackets. It was possible, however, to bear this limitation of the data with some equanimity, because of two considerations. The first

is that it seems reasonably certain, on the basis of common knowledge, that there are but relatively few women in the highest economic and social brackets in the populations of large cities who do not practise some form of what they at least believe to be contraception. In the second place, where information is most needed regarding the problems of this study is in respect of the masses—the less fortunate economically. It is just here that the present material furnishes information.

It appears that, in this sample of 2,000, over 63 per cent of the white group and over 96 per cent of the Negro group fell below the "moderate circumstances" grade as defined in the detailed report.

In regard to *education*, it appears that 32.4 per cent of the white women in the sample had attended high school or college (or university) or both, and 26.9 per cent of the Negro women.

Marital Status. Out of the 2,000 women included in this paper 1,824, or 91.2 per cent, were living in wedlock at the time of the making of the record, and 176, or 8.8 per cent, were not. Nearly all of the latter were young unmarried girls having their first illegitimate child. In the white group, 1,348, or 97 per cent, of the mothers were married, and 42, or 3 per cent, were unmarried. In the Negro group, 476, or 78.1 per cent, were married, and 134, or 21.9 per cent, were unmarried. This difference between the two racial groups is in accord with normal expectation in its sense.

Reliability. There is no particular *a priori* reason to doubt the reliability of the information recorded on the cards save in one respect to be presently discussed. Experience has shown that all family records are subject to natural errors arising from forgetfulness and carelessness. Some mothers do become vague about how many children they have had and

may forget the particular years in which they were pregnant. But in such respects the figures here dealt with are on no worse footing than are the official returns of the Census Bureau. As a matter of fact the present data are presumably on a higher plane of accuracy, in general, than any census data, because they are collected by trained medical men and women, and in the atmosphere of medical institutions (hospitals) with high standards of scientific accuracy in the making of records. The recorder has the individual under observation usually from ten days to two weeks before making the record.

But in one important respect, the present records are more intimately personal than official vital statistics; though not more so, be it noted, than obstetric and gynecological histories taken regularly and generally from patients in those departments of a modern, teaching hospital. We ask the patient whether she has used any method to avoid becoming pregnant. Her response may take one or the other of three forms. She may say yes, or no, or refuse to answer. If the answer is yes, there would seem to be no reason to doubt that she is telling the truth. There would be no motive to allege that she had practised contraception when she had not. Furthermore if she answers yes to the first question she must then describe in detail the methods used. It would be idle to allege that a trained medical worker, accustomed to taking case histories from patients, would not know if the woman were lying in this direction.

In the case of the third alternative (refusal by the patient to answer) the case would not appear in the records at all. Experience in this investigation, and in earlier unpublished studies of a similar character to the present one, has demonstrated that the number of women who flatly refuse to discuss this matter with their hospital physician is extremely

small—so small as not to affect the adequacy of the sampling in an appreciable degree.

This leaves for discussion only the second alternative. There may be a motive for a patient to say that she has not practised contraception when she has. This motive may be either personal, or religious, or social, or some sort of vague fear of consequences. Thus a Catholic patient in a Catholic hospital would presumably be disinclined to say whether she had practised contraception. But, as already stated, we have not included Catholic hospitals in our study, and for just this reason. Furthermore it needs to be considered that, again, a medical man or woman trained in history taking becomes adept in detecting falsehoods in the patient's statements. Notations on the cards indeed occasionally tell of the breaking down of an original "no" to the contraception question, and the eliciting of a final affirmative answer and the whole detailed story. The whole relationship between patients and their physicians works greatly in favor of the getting of accurate and reliable answers. Normal women trust their physicians. After a delivery they are grateful for the care and attention they have had. They have no fear of the violation of their confidences. Another point is that the reproductive record itself often gives the recording physician a clue to further questioning if a woman at first says she has not practised contraception but actually has.

The methodology of the scientific study of human behavior in sexual matters has lately been discussed with critical acumen by Harvey.[6] His final conclusion is (p. 185) that: "Combining the questionnaire with the case study, as complementary functions of the same method, should yield the most productive as well as the most reliable results in the

[6]Harvey, O. L.: The Scientific Study of Human Sexual Behavior. *Journal of Social Psychology*, 1932, iii, pp. 161-188.

study of human sexual behavior." It will be plain from what has preceded that a combination of the case and questionnaire techniques is precisely the methodology of this present investigation. As in the case method a technically trained person gets the data from the individual; the information is kept within a prescribed pattern as in the questionnaire; the multiplication of cases is achieved by the employment of many trained observers. The inevitable small loss in uniformity of viewpoint which this latter point entails will, to a considerable extent, be compensated for in the end result by the large amount of material which will be obtained—so large as to be statistically respectable.

Altogether, after careful study of these records and many years experience in collecting data regarding sexual matters, I have a considerable degree of confidence in the general accuracy of these records. I am sure they are not 100 per cent accurate, in the sense of the physical sciences. No records in human biology, "official" or otherwise, ever are, and are not likely to be. But I am equally confident that these records as to contraception are of the same general order of individual reliability as age records in a census report, and more reliable than records of cause of death in mortality statistics. In the present case, just as in demographic statistics generally, the data may be regarded as sufficiently accurate individually to warrant careful analysis, and at the same time containing enough errors to compel caution in drawing conclusions.

RESULTS

On account of limitation of space it will not be possible to discuss in this abstract the results of the tabulations of the first 2,000 cases which have already been made and are discussed in the detailed report, except in regard to two points, namely, the extent to which contraceptive methods were used in this group of women and their effectiveness as used.

CONTRACEPTION

Frequency. Table 1 gives the data regarding the proportion of these 2,000 women who have at some time, or regularly, practised contraception, or at least what they supposed to be contraception.

The following comments may be made upon Table 1:

1. In this group of 2,000 women taken as a whole the practice of some form of contraception was rather more than twice as prevalent relatively among the white women than it was among the Negro women. This result accords with what would be expected *a priori*. The American Negro, probably generally and certainly under urban conditions, exercises less prudence and foresight than white people do in all sexual matters.

2. Just under 36 per cent of the 1,390 white women had ever used any means to prevent conception. For the 1,348 married white women living in wedlock the percentage practising contraception rises insignificantly to 36.6 per cent.

3. As has already been pointed out in an earlier section

Table 1. Showing the absolute and relative numbers, among 2,000 women, of (a) those who have used some method or methods for preventing conception, and (b) those who deny any use of such methods.

	White		Negro		Total	
	Number	Per cent	Number	Per cent	Number	Per cent
TOTAL	*1,390*	*100.0*	*610*	*100.0*	*2,000*	*100.00*
a. Those who have used some method, or methods, regularly or intermittently, for preventing conception	497	35.8	94	15.4	591	29.55
b. Those who deny the use of any method for preventing conception	893	64.2	516	84.6	1,409	70.45

of this paper, the percentages in Table 1 of those practising contraception are to be regarded as minimum figures. We are justified in saying that in this sample of material *at least* 35.8 per cent of the white women, and 15.4 per cent of the Negro women, had practised some form of interference with conception. It will doubtless be alleged that some of the women recorded as not having practised contraception gave false information on the point, and should really be included with the positive group. I have given reasons earlier in this paper for the belief that the number of such women, if any, is probably very small. But let us make the assumption that 20 per cent of the white women who said that they had never practised contraception lied when they said so. Transferring them to the other group would give a hypothetical total of 675.6 women admitting the practice of contraception. But this is still only 48.7 per cent, or less than half, of the total white women (1,390) in the sample. This is, however, an extreme assumption of unreliability in the data. No one connected in any way with the work, or having direct contact with the patients, would entertain it for a moment. It represents probably at least ten times any actual falsification that may possibly be present in the data on the point.

4. In sum, it appears that among the 2,000 women in this sample, coming preponderantly from the lower social and economic classes in large urban centers, the practice of contraception is far less prevalent than it has been assumed to be by some of those who have discussed the problem of declining birth rates, and is much less frequent than in the classes on high social and economic levels.

EFFECTIVENESS OF CONTRACEPTION AS PRACTISED

It has been pointed out earlier in this paper that there is often a regrettable failure to distinguish sharply between the

potential effectiveness of contraceptive methods in the hands of intelligent and careful persons technically advised in birth control clinics or by physicians, and their *actual* effectiveness as practised in the general population. It is the latter category with which we are solely concerned in this investigation. The data give the entire reproductive histories—and particularly the number and dates of the pregnancies—of two groups of women; the C+ women who have tried to prevent conception and the C– women who have made no such attempt. Even if there is some inaccuracy in the records on the C– side, the total amount of attempted contraception in the C– group can only be regarded as insignificantly small as compared with the C+ group. The present data, then, permit an answer to this question: Is the rate of occurrence of pregnancy per 100 person-years exposure to risk of pregnancy different in the two groups of women, and if so by what amount and in what direction? A clear-cut answer to this question is the first step necessary to any scientific understanding of the effect of contraception, as actually practised in the population, upon the growth of population.

In this first preliminary paper, no attempt will be made to give anything more than a rough, crude answer to this question. All methods of contraception will be treated together; no attempt will be made to separate regular from intermittent use of contraceptives; no account will be taken of possible differences in the age distribution of the two groups. The only purpose of presenting any figures now is to give some indication of the trend of the data. It would be obviously foolish to enter upon a refined statistical analysis of the first 2,000 cases alone, when it is probable that there will ultimately be available for such analysis more than 15,000 such cases. In subsequent reports upon the whole

mass of material the analysis will go into great detail.

From Table 2, the following points are to be noted:

1. The data included in the table comprise in total 6,869.26 person-years exposure of married women to the risk of becoming pregnant, with 5,176 resulting pregnancies. Even though preliminary, this is a respectable body of material.

2. The mean number of years exposure to risk of pregnancy for each married woman exposed in this experience was approximately one year greater for the C+ white women than for the C– white women, and 0.84 of a year greater for the C+ Negro women than for the C– Negro women. This means that the women in this experience who practised contraception had been longer married on the average than those who did not practise it.

3. The present data indicate that the average duration of the marriages of women delivered in hospitals in large cities is something upwards of four years. This observation is of some interest as indicating that it is not solely the young bride who seeks the hospital to get through the somewhat terrifying experience of her first confinement.

4. There is no substantial difference between the whites and the Negroes in this experience in respect of the mean number of years per woman of exposure to risk of pregnancy.

5. The mean number of pregnancies per married woman (shown in the last column of the table) as experienced throughout the entire reproductive life up to the time of the record, is *higher* for the C+ women than for the C– women, by an insignificant amount in the white group, and by a considerable amount among the Negroes. This result, on its face, would seem to indicate that the contraceptive techniques employed by the C+ women had something less than zero effectiveness. Although it is by exactly the same kind of statistical procedure as this that birth control prop-

Group	Number of Women		Person-years Exposure to Risk of Pregnancy		Average Number of Years of Exposure per Woman		Total Pregnancies Experienced		Pregnancy Rate per 100 Person-Years Exposure		Mean Number of Pregnancies per Woman	
	C+	C–	C+	C–	C+	C–	C+	C–	C+	C–	C+	C–
TOTAL EXPERIENCE	581	1,243	2,554.36	4,314.90	4.40	3.47	1,741	3,435	68.16	79.61	3.00	2.76
White	493	855	2,168.77	2,940.56	4.40	3.44	1,376	2,294	63.44	78.01	2.79	2.68
Negro	88	388	385.59	1,374.34	4.38	3.54	365	1,141	94.66	83.02	4.15	2.94

Table 2. Pregnancy rates per 100 person-years exposure to risk of becoming pregnant among married women (a) who have, and (b) who have not used contraceptive methods. In this table, C+ denotes women who have regularly or intermittently used contraceptive methods. C– denotes women who are reported never to have used contraceptive methods.

agandists procure evidence of the effectiveness of their particular techniques, the results cannot be taken at their face value, either in the present case or in theirs. The statistical fallacy lies in the fact that the simple average numbers of pregnancies per woman take no account of differences in exposure to risk in the C+ and C– groups. This leads us to

6. The pregnancy rate per 100 person-years exposure to risk of pregnancy is 14.57 points lower in the C+ group of white married women than in the C– group. That is to say, with the methods of contraception actually practised by the white married women in this sample there was a concomitant reduction in the pregnancy rate per person per unit of time of slightly under 20 per cent below that which obtained in a comparable group of women making no attempt at contraception over approximately the same time. This is obviously not a particularly high degree of effectiveness. But

it must be again clearly understood that we are not dealing here with theoretical potential effectiveness, but with actual effectiveness, as practised in and by this group of women. Furthermore, no attempt is made in this preliminary analysis to get at the causes of the relative ineffectiveness of the contraceptive practices in the mass. In some cases, it is known to have been due to periodic interruptions of the practice in order to have "wanted" children. In other cases it is known to be due to carelessness and indifference. But in the present preliminary study the only attempt is to indicate roughly the *demographic* effectiveness of contraception in a particular sample of the population, as distinguished from individual instrumental or technical effectiveness. In short, what we have here is an expression of the effect which contraception, *as actually practised*, had upon the pregnancy rate of 493 white women, in contrast to the pregnancy rate of 855 white women, of a similar sort and under similar circumstances, who made no attempt to interfere with their natural fertility. The difference is not as great as it might have been predicted to be.

7. In the case of the Negro married women, the pregnancy rates per 100 person-years exposure to risk of pregnancy is considerably *higher* among the C+ women than it is among the C– women.

8. It is of interest to compare the findings set forth in Table 2 with other direct investigations from nonpropagandist sources regarding the effectiveness of contraception as actually practised. Davis[7] found in her first questionnaire group of 1,000 women, taken from considerably higher social, educational, and economic planes than the present sample that (p. 16) "the group which used contraceptive measures

[7]Davis, Katherine B.: Factors in the Sex Life of Twenty-two Hundred Women. New York, Harper and Brothers, 1929, pp. xx + 430.

has a higher average of pregnancies and of children than the group which did not use them." There was, however, no attempt in her study to determine true pregnancy rates, taking account of exposure to risk. For reasons stated above, the average-per-person figures of either pregnancies or children cannot be taken at their face value. Furthermore, probably in association with their higher social-economic status, the women in Dr. Davis' group showed distinctly lower fertility than the women in the present sample, insofar as it may be roughly judged from averages per person. Thus her C+ group had an average of 2.50 pregnancies per woman as against 2.79 in the present C+ group; and her C– group had an average of 1.65 pregnancies as against 2.68 in the present C– group.

Brown, Greenwood, and Wood[8] dealt with data from 634 married English women of the middle classes, in the English sense—a considerably higher social and economic level than characterized the 2,000 women of the present study. Of these English women, 492 had attended a college or university; the remainder, 155 in number, had not, but were, however, sisters or cousins of those who had. In this material it was found that there was (p. 199) "no sensible difference between the size of family in 'limited' [i.e., those in which some form of contraception had been practised] and 'unlimited' marriages."

In bringing to a close this brief and inadequate abstract of the first preliminary report on an investigation, which will require considerable time for completion, I wish to take the opportunity again to express my deep appreciation and gratitude for the help we have had in the enterprise from the officials of the Milbank Memorial Fund; from a host of hos-

[8]Brown, J. W., Greenwood, M., and Wood, F.: The Fertility of The English Middle Classes. A Statistical Study. *Eugenics Review*, 1920, xii, pp. 158-211.

pital internes, residents, physicians-in-charge, and executives; and from leading obstetricians and medical executives of the country, particularly Dr. George W. Kosmak and Dr. Linsly R. Williams. Space is lacking to mention them all here, as will be done in the detailed reports, but without their fine and unselfish cooperation nothing whatever could have been accomplished in this enterprise.

TRENDS IN MORTALITY AND LIFE EXPECTANCY[1]

by DOROTHY G. WIEHL

MOST men and women approaching the age of fifty probably believe, if they think about it at all, that their chance of living to a ripe old age is much greater than the chance their parents had and undoubtedly greater than that of their grandparents. They have heard or read about the great advances which have been made in the science of medicine and are aware of the conquest of many diseases that plagued former generations, such as cholera, yellow fever, smallpox, typhus, typhoid, and malaria. It is common knowledge that death rates have been declining in all parts of the country for periods of twenty-five to fifty years and the residents of most communities view with justifiable satisfaction this evidence of the improved healthfulness of their community. What everybody does not know is that the gross death rate is an average index of mortality for *all* ages. It does not apply to persons fifty years old because the death rate at that age differs widely from the rate at twenty-five, let us say. Even though the gross death rate is declining, it is possible for the rate among some age groups to be stationary or increasing, and that is exactly what is happening in the United States. Mortality among infants, children, and young adults has declined strikingly, but, among older adults, death rates have actually increased during the past half-century.

The records necessary for the study of mortality trends over a long period of years are not available for the entire United States. Not until 1900 was the collection of death records begun by the United States Bureau of the Census,

[1]From the Division of Research, Milbank Memorial Fund.

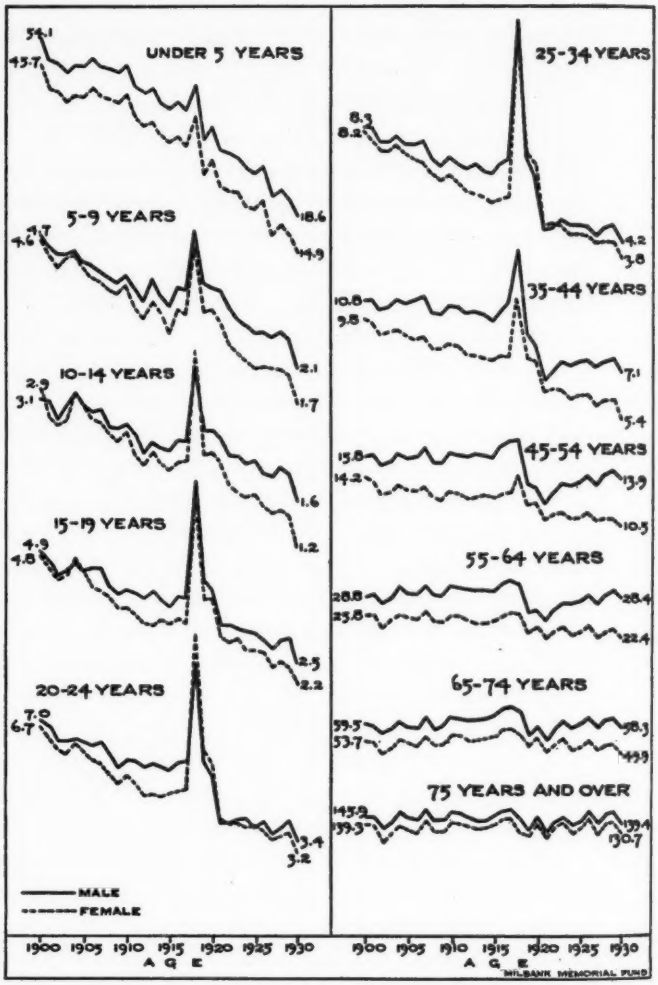


Fig. 1. Trends in mortality among persons of different sex-age groups in the registration states of 1900, 1900-1930. A logarithmic ordinate scale is used to indicate the rate of change by the slope of the line. The figures inserted are deaths per 1,000 population at the beginning and end of the period.

and then only for ten states (Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Michigan, and Indiana) and the District of Columbia. For these states, death rates among specific sex and age groups are shown graphically in Figure 1 for the thirty-one years from 1900 to 1930. For longer periods, registration of deaths in a number of cities and a few states has been fairly complete. Massachusetts affords a fairly large population for which early mortality records are available and the annual death rates according to sex and age have been compiled[2] for the period 1868 to 1930 and are presented in Figure 2.

The series of lines in Figures 1 and 2 show the relative changes that have occurred in the death rates for various age and sex groups. The rates have been plotted in such a way (on logarithmic scales) that the slope of the line indicates a proportionate change and every line is directly comparable with every other line. We are thus able to judge whether or not the rate of decline for any group has been greater or less than that for any other.

Some of the major indications, as regards the general course or trend of mortality, especially as found in the Massachusetts charts, may be summarized briefly, as follows:

1. During the years from 1868 to about 1890, mortality rates for the younger age groups fluctuated about an approximate level, and for ages above forty the rates were increasing.

2. Since 1890, a marked decline in the rates for each age group under forty has been in progress.

3. Among *men* between forty and sixty years of age, the high mortality level reached between 1890 and 1900

[2]Data were taken from the *Annual Reports* of the State Department of Health of Massachusetts for the years 1868 to 1899 and 1912, 1913, and from the reports, "Mortality Statistics," of the United States Bureau of the Census for other years.

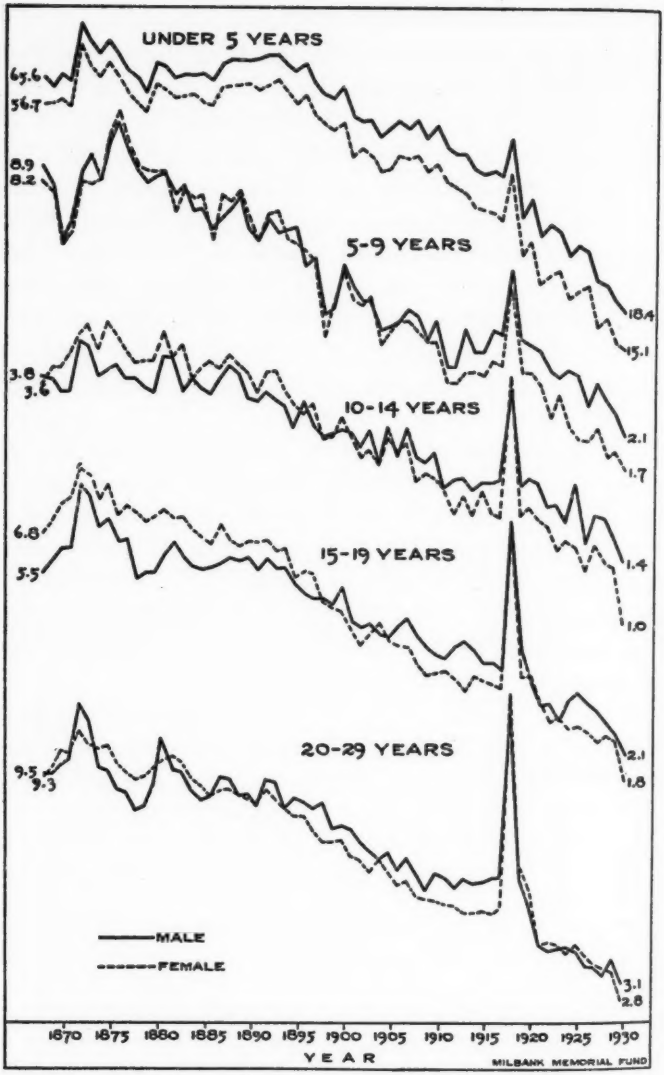
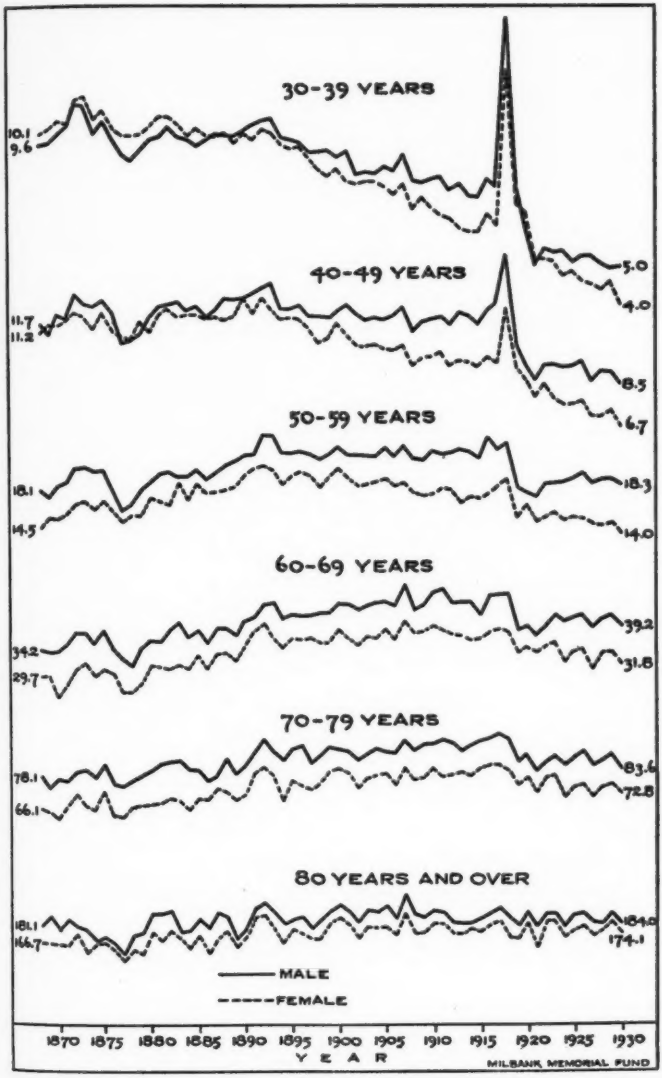


Fig. 2. Trends in mortality among persons of different sex-age groups in Massachusetts, 1868-1930. A logarithmic *(continued on page 65)*



ordinate scale is used. The death rate per 1,000 population is given for the first and last year of the period.

Table 1. Abstract of life tables for the Original Death Registration States and Massachusetts, 1929.[1]

Age	Number of Persons Surviving to Certain Ages from 100,000 Live Births of Each Sex				Complete Expectation of Life in Years			
	Original Registration States		Massachusetts		Original Registration States		Massachusetts	
	Male	Female	Male	Female	Male	Female	Male	Female
0	100,000	100,000	100,000	100,000	56.81	60.36	58.11	61.36
1	92,980	94,416	93,101	94,583	60.06	62.90	61.38	63.86
2	91,952	93,510	92,015	93,715	59.72	62.50	61.10	63.43
3	91,396	93,015	91,464	93,246	59.08	61.83	60.46	62.75
4	90,996	92,667	91,132	92,901	58.34	61.06	59.68	61.98
5	90,676	92,381	90,855	92,622	57.55	60.25	58.86	61.16
6	90,403	92,146	90,606	92,390	56.72	59.40	58.02	60.32
7	90,163	91,941	90,380	92,198	55.87	58.53	57.17	59.44
8	89,951	91,759	90,173	92,030	55.00	57.65	56.30	58.55
9	89,758	91,596	89,985	91,883	54.12	56.75	55.41	57.64
10	89,581	91,447	89,810	91,744	53.22	55.84	54.52	56.73
11	89,414	91,313	89,649	91,615	52.32	54.92	53.62	55.81
12	89,255	91,184	89,497	91,490	51.41	54.00	52.71	54.88
17	88,302	90,450	88,726	90,773	46.94	49.42	48.14	50.29
22	86,830	89,060	87,470	89,582	42.69	45.15	43.79	45.93
27	85,117	87,448	85,959	88,155	38.50	40.93	39.52	41.63
32	83,226	85,680	84,277	86,510	34.31	36.72	35.26	37.37
37	80,853	83,647	82,305	84,580	30.24	32.55	31.04	33.17
42	77,921	81,263	79,806	82,445	26.29	28.43	26.93	28.96
47	74,121	78,172	76,373	79,640	22.50	24.45	23.02	24.89
52	69,081	74,196	71,861	75,874	18.95	20.62	19.30	20.99
57	62,466	68,645	65,655	70,601	15.68	17.08	15.88	17.36
62	53,966	61,258	57,203	63,233	12.74	13.83	12.84	14.08
67	43,875	51,709	46,541	53,630	10.08	10.89	10.20	11.14
72	32,303	39,821	34,607	41,879	7.79	8.39	7.84	8.54
77	20,612	26,820	21,877	28,605	5.79	6.22	5.94	6.32
82	10,201	14,205	10,969	15,429	4.27	4.59	4.50	4.65

[1]Constructed by the method described in Newsholme, Sir Arthur, and Stevenson, Dr. T. H. C., The Graphic Method of Constructing a Life Table Illustrated by the Brighton Life Table 1891-1900. *Journal of Hygiene*, 1903, iii, p. 297 ff.

continued without change until 1917. In 1919 and 1920, the death rates dropped well below this level, but, in the last decade (1921–1930), the general tendency has been

upward again. The rates for men forty to forty-nine years of age are now somewhat lower than the death rates of 1870 and those for men fifty to fifty-nine years of age are about the same as in 1870.

4. Among *women* between forty and sixty years of age, the trend in mortality during the past thirty years has been slightly downward, but at a much slower rate than among women in the younger age groups. The mortality experience for women aged forty to fifty-nine years is in striking contrast to that of men.

5. Above sixty years of age, the general trend of mortality throughout this sixty-year period has been slightly upward for both men and women.

What is the influence of these changes in mortality on the length of life of the population? The answer is best obtained from a comparison of early and recent life tables and is made possible by the construction of 1929 tables for Massachusetts and the Original Registration States given in Table 1. The first part of the table shows for each sex the number of persons which would survive to certain ages from 100,000 born alive, if they were subjected to the mortality hazards of 1929. The survivors at each age obviously depend on the specific mortality of all younger ages. The second part of the table relates to the expectation of life and indicates simply the *average* number of additional years persons of given ages would live if they were subjected to 1929 mortality risks. Unlike the number of survivors, the expectation of life for any age depends on the specific mortality rates of all older ages.

The effect of the declining death rates for young persons on the number of survivors at various ages is readily seen from Figure 3 which compares the survival curves for the Original Registration States for 1929 and for the three-year period centering on 1901. The sharp drop in infant and child

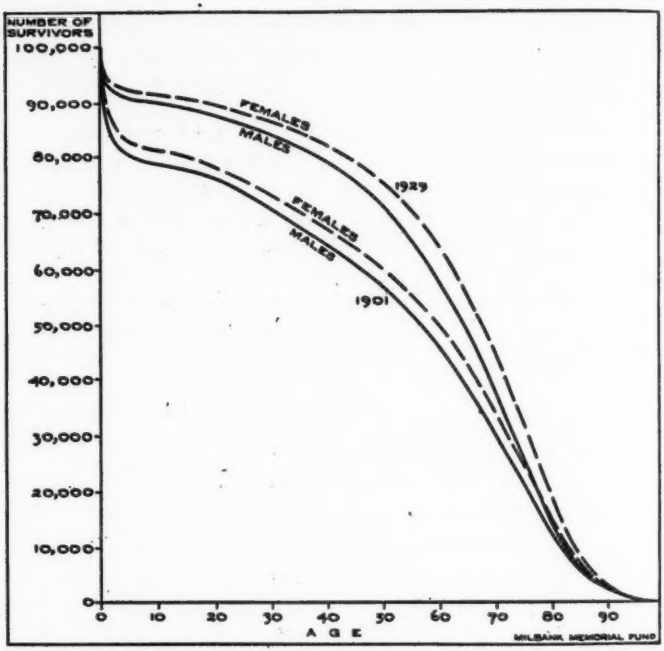


Fig. 3. Number of survivors to each age from 100,000 liveborn persons of each sex, for the Original Death Registration States in 1901 and 1929.

The data for 1901 are from *United States Life Tables, 1890, 1901, 1910, and 1901-1910,* and those for 1929 are from Table 1.

mortality during this time resulted in 10,128 more of our initial 100,000 male "life table babies" reaching their fifth year, and the same changes, together with the favorable mortality trends in late childhood and the early adult years, brought 14,545 more of them to their fiftieth year. Similar increases in the number of female survivors were 9,262 and 15,519 respectively. The improvement continued to the advanced ages but became rapidly smaller, due partly to the absence of further favorable changes in mortality, but prin-

cipally to the fact that more people had to die in the older ages, since more survived to them.

The expectation of life at birth summarizes more effectively the mortality at specific age periods throughout life. A boy baby born in 1929 has, according to this computation, an expectation of life of 56.81 years, and a girl baby 60.36 years. These babies had prospects of 8.93 and 9.66 more years of life respectively on the basis of the 1929 experience than on that of 1901 (Fig. 4), the gains representing in each case an increase of about 19 per cent in the twenty-eight years.

At no age after birth were the increases in the expectation of life so great, although they remained exceptionally large during the first five years and important during the first thirty. This is the result of two facts: (1) the largest improvement in mortality occurred in the ages of infancy and early childhood, and (2) deaths avoided in infancy raise the average expectation of life much more than those avoided later in life. At age forty-two, the 1929 expectation of life for men was about the same as that for 1901, and at each older age, it was somewhat lower than in 1901, reflecting the slight rise in mortality rates for all ages over fifty-five. The 1929 expectations of life for women remained higher than those in 1901 through the fifty-sixth year, and then declined only a little below the corresponding figures for the beginning of the century, as a result of favorable mortality trends in all groups under seventy-five years of age. Since the mortality rates of 1929 were somewhat higher than those of either 1928 or 1930, attention should be centered in the case of both sexes on the absence of an improvement in the length of life of middle-aged and older persons, rather than on its slight decline.

Changes in the expectation of life since the beginning of the past decade are also shown in Figure 4, but since the years 1919 and 1920 experienced a relatively low mortality

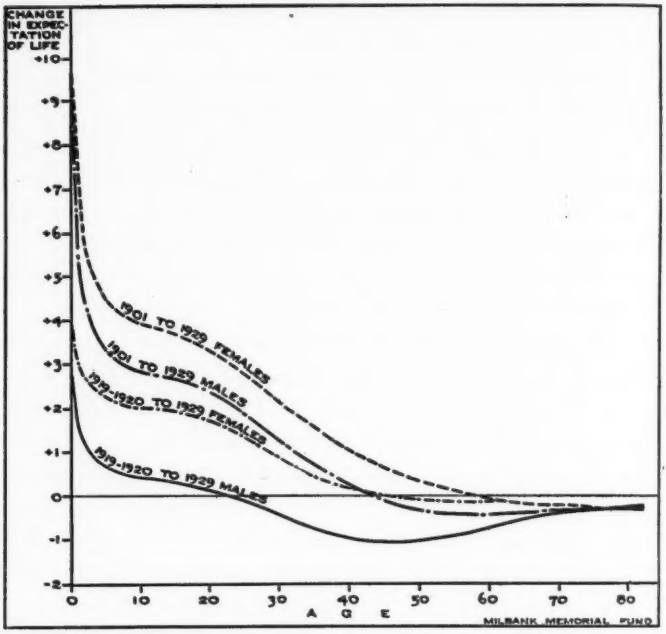


Fig. 4. Changes in the expectation of life of each age and sex between 1901 and 1929, and between 1919-1920 and 1929, for the Original Death Registration States.[1]

and 1929 had higher death rates than either 1928 or 1930, the comparison tends to minimize the gains and maximize the losses. Even under these circumstances, the expectation of life at birth increased remarkably for both sexes, and that for women of each age up to thirty showed substantial gains. In the case of men, however, all the important gains took

[1]The years of increase in the expectation of life are shown by the distance above the base line and those of decrease by that below. After the first year, the lines representing changes between 1919-1920 and 1929 are graphic interpolations between the ages ending in two and seven, for which the expectations are shown in Foudray, Elbertie: *United States Abridged Life Tables, 1919-1920*. The source of the remaining data employed in this figure is given in the caption for Figure 3.

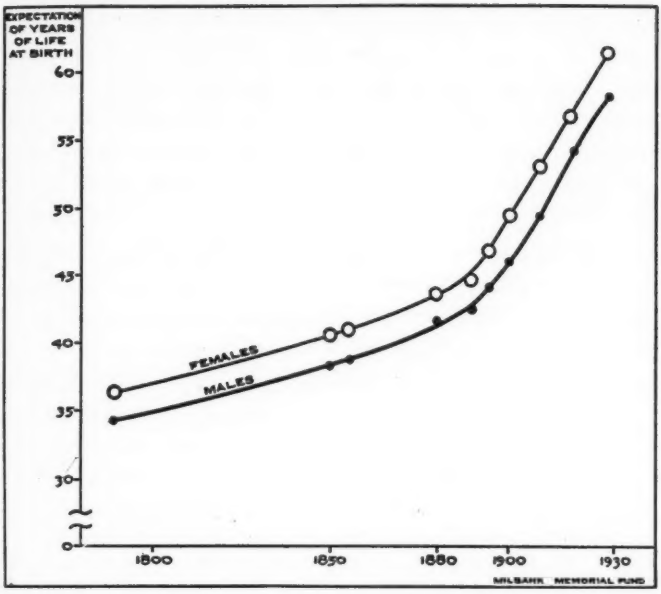


Fig. 5. Trend in the expectation of life at birth in Massachusetts, 1789 to 1929, as shown by various life tables.[1]

place at ages under ten years, and after thirty there were severe losses, resulting from the rise during the decade of the mortality of males over thirty-five years of age.

Thus far, attention has been confined to the life tables for the Original Registration States which only carry us back to the beginning of the century. The tables for Massachusetts, however, go back to 1789, and permit us to view the more recent increases in the expectation of life at birth in a

[1]The data for 1850, 1878-1882, and 1893-1897 are taken from a compilation of life tables presented in "A Historical Retrospect on the Expectation of Life—II," *Statistical Bulletin*, Metropolitan Life Insurance Company, March, 1928, ix, No. 3, pp. 5-8, and those for 1789 and 1855 are estimated from the expectations given in the same article for the population undifferentiated by sex. The expectations for 1890, 1901, and 1910 are taken from the *United States Life Tables, 1890, 1901, 1910, and 1901-1910*, and those for 1919-1920 from Foudray, Elbertie: *United States Abridged Life Tables, 1919-1920*. Data for 1929 are from Table 1.

larger perspective. Figure 5 assembles the material from the available tables of the eighteenth, nineteenth, and twentieth centuries. The early tables were doubtless inexact, but they serve well enough to give us the general picture. From 1789 until approximately 1890, there appears to have been a gradual increase in the average length of life, but, at the end of the century, a rapid acceleration began which developed by 1900 into an upward sweep that thus far shows no definite signs of breaking. That so rapid an increase in the average length of life will continue for another decade is not at all probable. Progress thus far has come largely from the tremendous improvements in infant and child mortality. As the death rates in these ages approach a minimum, further gains will probably come more slowly and, unless present trends are reversed, even these gains will be offset to some extent by the rising mortality rates of the middle and older ages.

NEWS DIGEST

County as Health Administrative Unit Approved by President and President-Elect

An emphatic endorsement of the county as the unit of local health administration instead of the township or the village was given by President Hoover in his address on October 24, 1932, at the annual meeting of the American Public Health Association in Washington. The President became impressed by the value of the county health units, about one hundred in number, which were established in the regions affected by the Mississippi River flood in 1927, following conferences which he, as director of relief, had called.

"By every means within my reach," he says, "I have ever since promoted the idea of establishing these units in every one of our five thousand counties in the United States."

It will be remembered that Cattaraugus was the first county in New York to avail itself of a permissive law authorizing the creation of county health departments in this State. The Cattaraugus County Board of Health, with assistance from the New York State treasury and from the Milbank Memorial Fund, demonstrated the effectiveness of the county as a unit for the administration of rural public health work. Three other counties in New York have since organized local health work on the county basis with great success.

The *New York Herald Tribune*, commenting on President Hoover's address, states that "in New York the weight of informed opinion is strongly for the county health units" and recalls Governor Roosevelt's approval of his Special Health Commission's recommendation in 1931 that their establishment in New York State be made mandatory. This Commission, headed by Dr. Livingston Farrand, president of Cor-

nell University, specifically recommended "that the present system of local health service in the State be reorganized by substituting the county for the town and village as the local unit, with the appointment of a county board of health and health commissioner in all counties." It further advocates that, while the county health district should include the whole county, cities should be "permitted to retain their boards of health and health officers," unless they choose to abolish them or to join in a combined city-county board of health.

◎ ◎ ◎ *The Fertility of Social Classes in the East North Central States in 1900*

THE fertility of social classes in various types of communities of the East North Central States in 1900 is the subject of a paper by Clyde V. Kiser which appeared in the December, 1932, issue of the *Journal of the American Statistical Association*. This article is the first of two papers based on the transcripts of data from the original enumeration schedules of the 1900 United States Census pertaining to the fertility and social status of 42,432 women living in metropolitan, moderately urban, village, and rural communities of the East North Central States. The transcripts were secured as a result of the cooperation of the Division of Research of the Milbank Memorial Fund with the President's Research Committee on Social Trends.

Only women of childbearing age were included in the sample, and the data were further restricted to native whites of native parents who were living with husbands of similar nativity and parentage. On the basis of recorded occupations of husbands, nonrural women were divided into four social classes: professional, business, skilled-worker, and unskilled-laborer. Rural women were classified as farm owners, farm renters, and farm laborers. Cumulative birth rates, total births per 100 wives (age-specific and total standardized), were computed for women of each social class in each type of community.

Four facts of some significance emerged from the study. First, in each type of community an inverse association between fertility and social status existed in 1900. This relationship, however, was less marked among rural than urban social classes

and there was little difference between the rates of the two urban white-collar classes, professional and business. Second, rural women were conspicuously more fertile than the nonrural. Total rates standardized for age (births per 100 wives) in the four types of communities were: rural, 270; village, 220; moderately urban, 193; and metropolitan, 144. With the exception of unskilled laborers living in villages and in moderately urban centers, each urban social class was surpassed with respect to fertility by the least fertile rural class, farm owners. Third, for each urban social class, fertility was highest in villages, intermediate in moderately urban communities, and lowest in the metropolis. Rates standardized for both age and social class composition were: village, 210; moderately urban, 189; and metropolitan, 154. Fourth, a striking similarity of the three types of urban communities appears with respect to the order and spread of the rates for component social classes.

⊛ ⊛ ⊛ *Association of Physical Impairments with Subsequent Mortality*

DOES the presence of physical impairments, as found on medical examination of persons in comparatively good health, mean in general an increased risk of mortality? If so, how long does such excess persist? What specific impairments are most definitely associated with it? What causes of death?

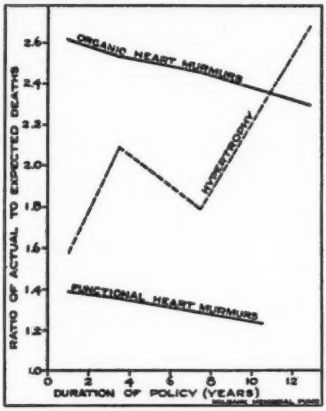


Fig. 1. Ratio of actual to expected mortality among policyholders with certain heart conditions found on examination, by specified duration of policy.

An effort to answer these questions has been made in one of the series of papers reporting a study by the Milbank Memorial Fund on the impairments of adult life.[1] The basic data

[1]Britten, Rollo H.: The Physical Impairments of Adult Life: Association with Subsequent Rates of Mortality, No. 9, in the Studies in the Diseases of Adult Life, from the Division of Research, Milbank Memorial Fund. *Journal of Preventive Medicine*, July, 1932, vi, No. 4, pp. 249-271.

were those obtained in the course of an investigation into the mortality of life insurance

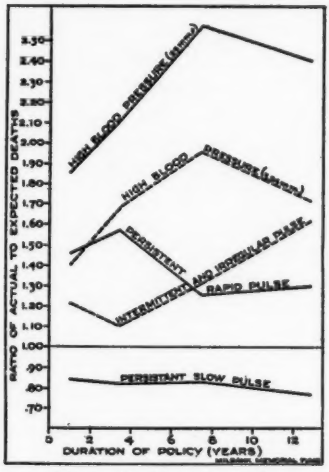


Fig. 2. Ratio of actual to expected mortality among policyholders with certain blood pressure and pulse conditions as found upon examination, by specified duration of policy.

policyholders according to the medical findings on the applicant examinations, a research made particularly to establish excess premiums for persons not up to average health.[2] The results are of great interest, in spite of the fact that in such examinations the impairments recorded may be as a rule more serious in degree than those found in routine health or periodical medical examinations.

The highest ratios of actual to expected mortality for persons of a given age and duration of policy occurred among those with the following impairments, noted during their applicant examinations: organic heart murmurs (distinguished very sharply according to the kind of murmur), cancer (with operation),[3] epilepsy,[3] high blood pressure, suspicious condition of lungs and tuberculosis, enlarged heart, fragile appearance, excessive weight (especially with a high abdominal-chest circumference ratio), gastric ulcer,[3] syphilis,[3] albumin in urine, persistent glycosuria, pleurisy with effusion.[3]

With respect to the persistence of such excess mortality, the results were very striking. Some of the records covered rates of mortality among persons insured as long as fifteen to twenty years, and in many cases the record was long enough to indicate the duration of the higher level of mortality. In the following conditions an excess mortality, with little tendency to be dissipated, continued for long periods: syphilis,[3] organic heart murmurs, hypertrophy of

[2]Medical Impairments Study, 1929. Compiled and published by the Actuarial Society of America and the Association of Life Insurance Medical Directors.

[3]History.

heart, high blood pressure, pulmonary tuberculosis, duodenal ulcer,[3] albumin in urine, high abdominal-chest circumference ratio.

In many cases, the impairment itself was the ultimate recorded cause of death, but excess mortality from other associated causes was one of the most significant of the findings. Only a few illustrations can be given. Persons with syphilis[3] showed three times the normal mortality from organic heart disease; persons with a constant, transmitted apex murmur and with moderate hypertrophy showed five times the normal mortality from

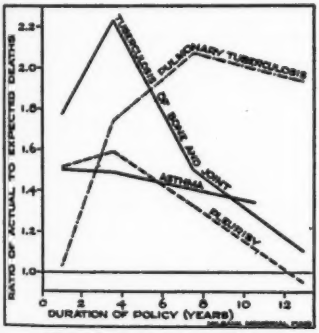


Fig. 3. Ratio of actual to expected mortality among policyholders with certain respiratory conditions, by specified duration of policy.

nephritis and Bright's disease (as well as twenty-one times the normal from organic heart disease); persons with asthma[3] showed five times the normal mortality from pneumonia, three

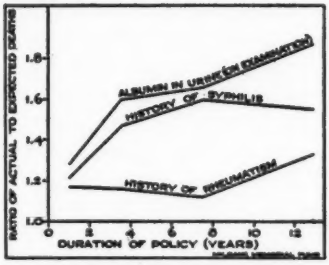


Fig. 4. Ratio of actual to expected mortality among policyholders found upon examination to have certain conditions.

times from influenza, and four times from organic heart disease and from tuberculosis.

● ● ● *Health Education, Recreation, and Safety Promoted by Bellevue-Yorkville Experiments*

A DEMONSTRATION of health education which was so successful that many of its essentials have been embodied as permanent features of the New York City school system, is described in a report recently prepared by Miss Nina B. Lamkin, who was in charge of the work. The experiment, extending through three years, was conducted by the Board of Education of the City of New York,

the City Department of Health, and the Catholic School Board. Cooperating were staff workers from the metropolitan health demonstration in the Bellevue-Yorkville district of New York, which was initiated and financially aided by the Milbank Memorial Fund. The immediate field included the twelve grade schools in the district, with about 14,000 children and 450 teachers.

The basic results of the experiment were the decided shift in the school health education work from mere theory and a passive attitude on the part of the child to an interesting program of health activities; a correlation of this work with conditions at home and elsewhere outside of the school; a general improvement of the physical environment in the school; and a more extensive remedying of physical defects than ever before.

Among concrete improvements were greater attention to hand washing and cleanliness in the use of toilet facilities; more extensive provision of soap and towels by the City; better seating, lighting, and ventilation arrangements; better cooperation of the teacher, parent, doctor, and nurse in utilizing the findings of physical examinations; establishment of lunch rooms under school supervision; extension of clinical facilities; and the development of a mental hygiene program.

The experiment in the grade schools was made during 1927-1930. Similar work was successfully carried on in the junior high school for boys in the same district during 1929-1930.

The recreation program of the Bellevue-Yorkville Health Demonstration, which Miss Thelma E. Carpenter directed in 1927-1930, accomplished the triple purpose of promoting recreation, health, and safety, in cooperation with City departments and various social agencies. How these aims were integrated is told by Miss Carpenter in a report recently issued.

Several temporary playgrounds were opened in sideyards to supplement existing play facilities; children's outings to parks and adult hikes to the country were conducted; exhibits of toys were held at health centers and provision was made to entertain children in waiting rooms of clinics; physical examinations for children going to camps were standardized; neighborhood public health clubs were founded; "Young Pioneers" clubs were organized to report violations

of the sanitary code and to survey sanitary conditions in homes of members; and a recreation consultation service for nurses was developed, thus reaching preschool children and adults as well as school children.

Particularly effective was the visual education through the use of posters in the safety campaign. The recreation literature included pamphlets to promote outings and personal hygiene and mimeographed health programs for teachers.

During September this year, the Bellevue-Yorkville demonstration staff distributed 12,000 pamphlets and nearly 500 posters on home and street safety, and 6,000 pieces of literature on social hygiene, infant care, measles, diphtheria, infantile paralysis, and tuberculosis. The Baltimore Department of Health has recently asked permission to reprint a pamphlet on venereal disease published recently by the health demonstration staff.